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No. 2 Crushing Plant of Natomas Consolidated

By Richard H. Vail

SYNOPSIS—Natomas Consolidated of California operates three rock-crushing plants of which the No. 2 or Fair Oaks crusher is the largest. The product is a crushed rock for road making, railroad ballast, etc. The rock will be washed and the silt conveyed back to the dredged land, which it is hoped to resurface for cultivation.

Besides operating a fleet of 13 gold dredges, three of which are all-steel boats, Natomas Consolidated of California has three crushing plants at work reducing coarse dredge tailing to various sizes of crushed rock. Important changes are now in progress at its No. 2 or Fair Oaks crusher whereby the capacity and range of products will be increased. With an auxiliary washing plant, the company will be able to utilize completely the coarse dredge tailing, returning to the dredged ground the silt removed in the washing plant, thus giving the land a surface that will lend itself to almost any sort of cultivation—an achievement long cherished by this company, which is also engaged in an extensive irrigation and reclamation project in Sacramento County.

Conveyor to Storage Piles

Rock Going from Cars to Crusher

Natomas Becoming a Great Land Company

Few except those directly connected with the California dredging fields, realize the extent of the land interests of this company. Indeed Natomas Consolidated of California is evolving from a great dredging company into a great land company. For several years it has applied the profits of its gold-dredging industry to the acquisition and reclamation of large tracts of land in Sacramento Valley, its holdings now approximating 90,000 acres. Some idea of the extent of its work in this connection will be appreciated when it is stated over 60 miles of levee have already been built and that the present plans call for a total of 83 miles of levee to reclaim to cultivation lands that have in the past been subject to overflow from the Sacramento, Feather and Bear Rivers. The irrigated-land project of the company embraces 20,000 acres of higher land, suitable for olives, almonds, oranges and other citrus fruits; this area is in the neighborhood of the company's dredging lands in the Folsom or American River district. Part of this land will be retained by the company but a portion is being divided up for sale in 10- and 20-acre plots, which will be planted, tended and harvested by the Natomas land department, if the purchasers so desire. To the mining engineer familiar with the standing and methods of the Natomas organization, a proposal of this sort by Natomas Consolidated would certainly mean much more than the guarantee of the ordinary orchard or land company. While this irrigated-land project is not on dredged land, the company also has in mind eventually restoring its dredged lands to cultivation. In fact, some experimentation has been done in this connection and a small grove of eucalyptus and olive trees is already growing on some dredged land that was leveled off for the purpose of this experiment. It is planned, however, with the improvements now being made at the Fair Oaks crushing plant, to wash the coarse tailing and return to the surface of the land the fine soil or silt, restoring the ground to cultivation of any sort. Thus in time, the scar left on the country by the gold fleets of this company may be completely eradicated; indeed, it may be that these areas will be more productive

than the adjoining lands by reason of the remarkable "plowing" or aëration accomplished in the dredging.

Capacity of Crushing Plants

Two of the Natomas crushing plants are in the American River dredging field, at Natoma and at Fair Oaks, the No. 3 plant being in the Oroville dredging field. The plants are similar in general design and operation, and are in charge of E. J. Goodpastor; the nominal capacities are: For the No. 1 or Natoma plant, 1200 tons in 10 hr.; for the No. 2 or Fair Oaks, 1500 tons; the No. 3 plant at Oroville has a capacity of about 1000 tons in 10 hr. Production at the various plants is regulated more or less by the demand for road-making material. As the plants are similar in general arrangement only the No. 2 or Fair Oaks crusher will be described. While an auxiliary washing plant is being added at this works, it is so arranged that by merely moving a gate the washery may be cut out if desired and the crushing plant operated as before.

The No. 2 crushing plant is situated at Fair Oaks at the southwestern end of the Folsom district. It is about four miles from the No. 1 crushing plant at Natoma. The Fair Oaks plant was built after the plans of the Western Engineering & Construction Co. of San Francisco and was placed in operation in July, 1909. It is worthy of note that after nearly four years of operation, the plant during the last month had an operating record of 91% of the possible running time.

Cobbles Loaded by Steam Shovel

The plant is at present crushing from the coarse tailing produced by Natoma No. 4 dredge. The cobbles are loaded by a 45-ton Bucyrus oil-burning steam shovel into 4-cu.yd. side-dump Koppel cars, handled in trains of 10 on a narrow-gage track by an oil-burning dinky engine. The steam shovel can load about 2500 tons of cobbles in 10 hr. and the present practice is to dig down to within about one foot of the underlying bed of fine tailing. When the new washery is in operation it will be possible to dig closer to the fine tailing without danger of fouling the crushed-rock product, as any fines will be sluiced back over the "cleared land" making a layer of top soil which, it is estimated, will be from 1½ to 2 feet in depth. The steam-shovel crew comprises five men, an engineer, a trainman and three trackmen who assist in various work as well as attending to the extensions of the narrow-gage track leading to the crushing plant. This track, which is of 3-ft. gage, is now nearly a quarter of a mile long; it passes a receiving hopper and is arranged in a loop so that no switching of cars is necessary. The engine bringing in the loaded train leaves it at the hopper, and pushes out around the loop a similar train of 10 cars that have just been emptied.

The loaded cobble cars are emptied into the receiving hopper by two men who break with sledges any boulders too large to pass through the grizzly. The hopper opening is 20 ft. square at the top and is covered by a timber grizzly, the 6x8-in. bars of which are spaced eight inches apart and covered with ½x6-in. steel wearing plates. The hopper is lined with ⅜-in. steel and delivers to the No. 1 conveyor belt, which is 36 in. wide and seven-ply. This is a Robins conveyor, 166 ft. between centers, and operates at a speed of 125 ft. per min. and at an angle of 16°, which is the maximum angle for handling rounded material of the character crushed at this plant. The flow of material from the hopper is regulated by a gate controlled by hand and a man is stationed here to look after the general hopper operations; a boy is also employed at this point to pick off the belt any pieces of steel or wood that might damage or clog the crushing machinery. This boy also picks out any round pebbles from two to four inches in size; when there is a sufficient accumulation of these, they are shipped to cement plants for use in tube-mill grinding.

When the new washing plant now in process of construction is completed, all material from this first belt will be taken by a cross belt to the washing plant. After washing and sizing, the graded material is returned to the crushing plant, being delivered to the different equipment best suited to the particular sizes. Only washed cobbles, three inches or larger in size, will then enter the first trommel *A*, thus increasing greatly its capacity for finished product, and effecting a corresponding increase in the capacity of the various crushers that follow. The washed material, from 1½ to 3 inches in size, will be delivered to the crushing section containing the Symons disk crusher and the first set of corrugated rolls; the washed gravel from ⅜ to 1½ in. will be delivered to screen *C* and the washed material finer than ⅜ in. will be conveyed to any of the three easterly storage piles, or any portion may be delivered directly to make up rock mixtures.

The Crushing Equipment

The details of the crushing system will be readily understood by reference to the accompanying plan and section, so that a detailed description of the operations is unnecessary. It may be remarked in general that there have recently been a number of changes made in conveyor belts and chutes to increase the flexibility of the operations and to permit the making of special crushed-rock mixtures containing any desired proportion of the various components. The principal items of equipment in the No. 2 crushing plant comprise:

One 42x26-in. Farrell jaw crusher, handling boulders over 6 in. in size.

Four 36x10-in. Farrell jaw crushers; three of these breakers crush 3- to 6-in. cobbles, the fourth handles oversize from screens "E" and "F," over 2½ in. in size.

Two 40x20-in. Allis-Chalmers corrugated rolls; one set, with the Symons disk crusher, handles 1½- to 3-in. material, the other set of rolls crushing reject from screen "D"; i.e., over 1 in.

Six revolving screens; "A," 6x20 ft.; "B," "C," 4x14 ft.; "D," 5x15 ft.; "E" and "F," 5x24 ft.

Thirty-three Robins Conveying Belt Co. conveyors, having a total length of about 5000 ft. and varying in width from 20 to 36 in.

Four 100-hp. motors for driving 36x10-in. crushers.

One 150-hp. motor driving the 42x26-in. crusher.

One 150-hp. motor driving the two sets of corrugated rolls and the disk crusher.

One 50-hp. motor driving the No. 1 conveyor.

One 50-hp. motor driving screen "A."

Two 50-hp. motors driving loading conveyors from tunnels.

One 75-hp. motor driving loading conveyors from tunnels.

One 100-hp. motor driving screens "B" and "D" and four conveyors.

One 100-hp. motor driving screens "E" and "F" and three conveyors.

The principal equipment of the new washing plant includes:

One 5x30-ft. cylindrical revolving screen.

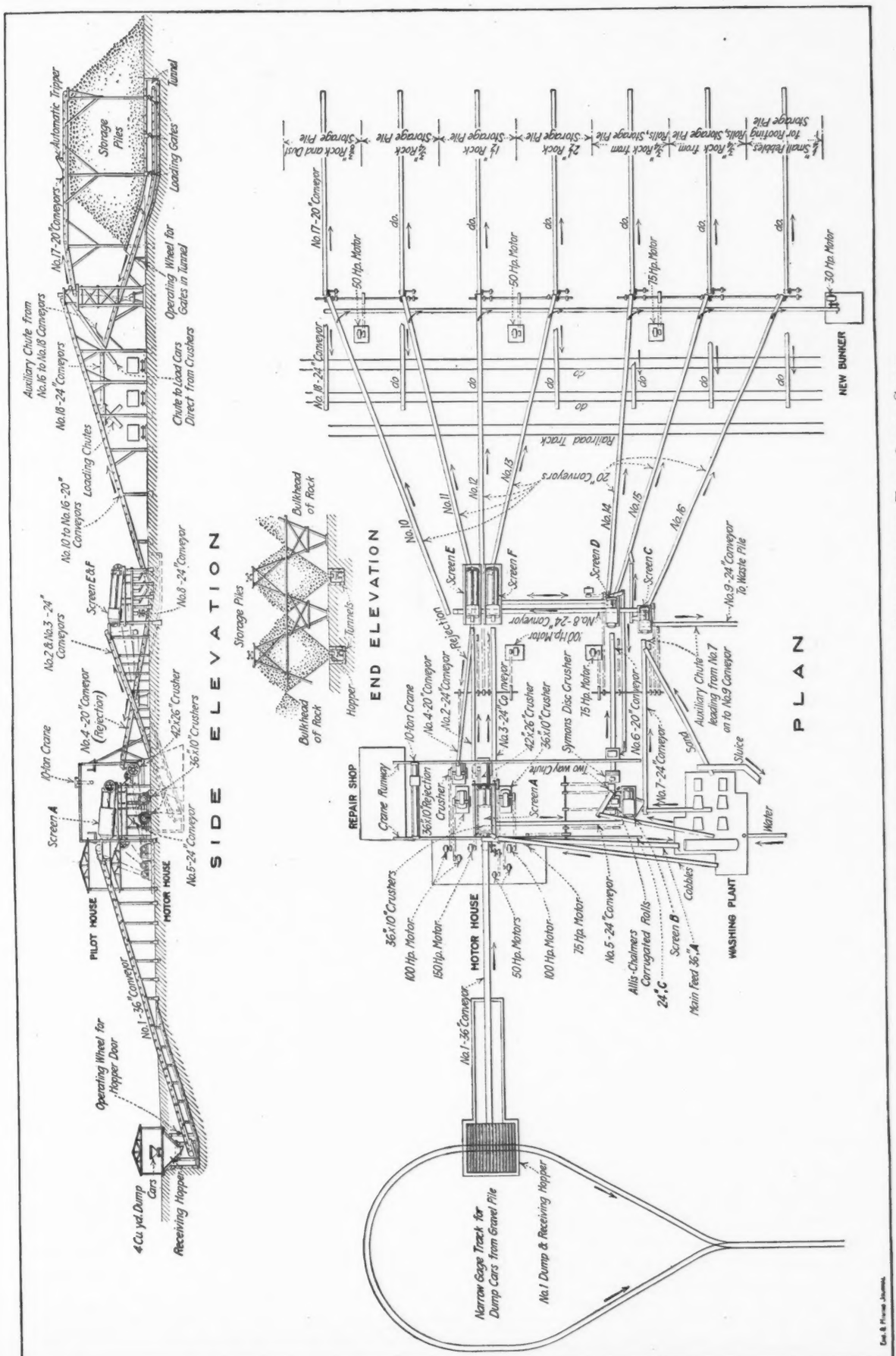
Four conical revolving screens, 48 and 66x84 in. long.

Nine washing nozzles for the various screens.

Two tilting settling tanks.

Five conveying belts varying from 20 to 36 in. in width.

One 100-hp. motor.



No. 2, Rock-Crushing Plant of Natomas Consolidated, Fair Oaks, Calif.

A Central Operating Room

As the crushing plant may be operated independently of the washing plant, its general features will be separately discussed. The washing system, being a new operation, will be described more in detail later. The crushing plant is operated by about 35 men and all important machines are controlled from a switchboard in what is known as the pilot house or operating room, situated in an elevated position near the top of the No. 1 conveyor. Here 13 switches enable the operator to start or stop any of the important equipment whenever a signal is received from any part of the plant. Red and white lights at each switch indicate the conditions and these signals are supplemented by a bell signal so that there is little opportunity to fail to stop or start a machine as desired. From the pilot house the operator has a view of all of the important conveying belts and in this way frequently detects any interruption of the operation before the local attendant gives him the signal.

The motors of the crushing plant are grouped in one room, where the dust may be more effectively excluded; however, there are a few individual motors at other points in the plant driving conveyors for loading, etc. Most of the motors are of General Electric make, mounted on a sub-base, thus providing a third bearing. Superintendent N. F. Patterson of this plant reports that before the sub-bases were employed, about $24 were spent in repairs at each motor every three months, mainly for rebabbiting bearings. The time for such repairs has been extended to once in three years, since the use of the sub-bases and additional outboard bearings. Electric power is obtained from the high-potential lines of the Great Western Power Co., being stepped down to 2300 volts at which pressure it is supplied to the motors of the crushing and washing plants. The transformers at this works have been placed in a concrete tank, which is below the ground level and completely covered.

All material entering the crushing plant is delivered by the No. 1 conveyor belt to screen *A* which is six ft. in diameter by 20 ft. long. When the washing plant is not in use, this trommel has a screen with 3-, 5- and 6-in. openings; the 3-in. section has a length of 12 ft. When receiving washed cobbles over three inches in size, the screen will have 5-in. and 6-in. perforations. The trommel is driven by bevel gear, and is made of soft steel spiders and a framework of 6x6x1-in. angles covered with ¾-in. tank steel, perforated as above mentioned. It is stated that manganese steel was tried on the screens but that the expense was not considered warranted.

Jaw Crushers for Coarse Cobbles

Boulders over six inches in size rejected by screen *A* pass to the 42x26-in. Farrell crusher, while cobbles from three to six inches in size are handled in three 36x10-in. Farrell crushers. The products from these crushers pass to screens *E* and *F* which have 1-in., 1⅞-in. and 2½-in. perforations, and ⅜-in. dust jackets to eliminate the fines. Any material over 2½ in. is returned to the fourth 36x10-in. Farrell crusher which is known as the rejection crusher.

Recently a hopper has been installed to receive the oversize from screens *E* and *F* and thus provide a steady feed for the rejection crusher. If a mixed product is desired, the oversize from these screens may pass out with the 2½-in. material, instead of going through the rejection crusher. There are cross conveyors between the screens of the coarse- and "fine-crushing" divisions of the plant so that a free transference of products may be made when desired.

The "fine-crushing" division of the plant receives the 3-in. reject from screen *A*, or when the washing plant is in operation, the washed products finer than three inches are sent directly to this portion of the plant. Screen *B*, which has 1½-in. perforations, will receive material varying from 1½ to 3 in. in size. Material coarser than 1½ in. will be sent to the 48-in. Symons disk crusher and the No. 1 set of 40x20-in. Anaconda-type corrugated rolls. These deliver their product to screen *D* which has 1-in. perforations and a ⅜-in. dust jacket. The so called ¾-in. and ⅜-in. dust products from screen *D* join the similar products from the coarse-crushing department.

The oversize from screen *D* is crushed in the second set of 40x20-in. corrugated rolls and returned to the same screen. Screen *C* is not now used, but with the washing plant in operation it may be utilized to screen the ⅜-in. to 1½-in. gravel, the oversize being crushed in the No. 2 rolls. The ⅜- to 1½-in. washed gravel may also be taken directly to storage when a mixture of this type is desired.

A 10-Ton Overhead Crane for Repairs

To facilitate repairs, there is installed over the crushing machinery a hand-operated 10-ton crane that runs on a timber structure, 100 ft. long, extending into the repair house, 24x48 ft., where are extra parts and such tools and machinery as are required to carry out the usual repairs of the plant.

Manganese steel is used for all crusher wearing parts and the roll shells are also of manganese steel. The use of the Symons disk crusher is in the nature of an experiment to determine whether the same work cannot be accomplished by this machine as is done by the 40x20-in. corrugated rolls, with less expense for repairs.

The belt conveyors in the plant vary in size from 20 to 36 in., the various sizes used being 20, 24, 30 and 36 in. On most of them, Robins belts are used and have given good service. The main 36-in., seven-ply belt leading from the receiving hopper has been in service for four years; it is still in fair condition and the superintendent considers it good for at least another year's wear.

Seven Stockpiles for Finished Products

The finished products of the crushing plant are taken to seven storage piles, each 100 ft. long by 40 ft. wide, and capable of being built up to a height of 40 ft. by means of trestles and overhead conveyors. Beneath each of the storage piles is a drawoff tunnel, 6x6 ft. in section and 100 ft. long, built of reinforced concrete 12 in. thick. The tunnels are each served by a 24-in. conveyor, 185 ft. between centers. These conveyors are fed by four arc gates connected by chain wheel and levers so that three of them may be operated in synchronism, the fourth being operated independently thus regulating the feed to the conveyors.

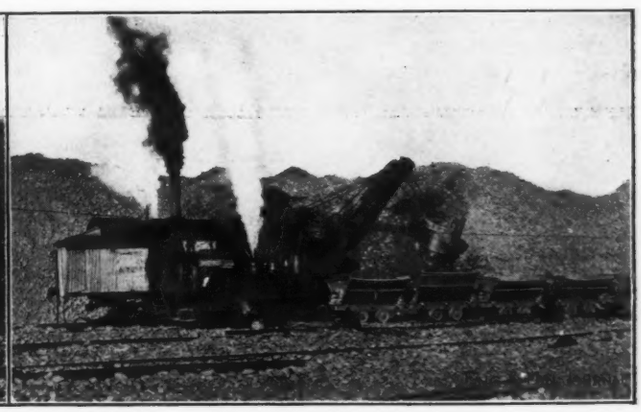
The conveyors discharge at a height of 25 ft. above the railroad loading tracks into a double, swinging chute so that the crushed products may be delivered into cars on either of the two tracks. Cars may be loaded on a third track directly from the crusher conveyors.

A recent improvement is a 600-ft., 24-in. cross conveyor that has been placed at the head of the crusher conveyors so that a mixed product containing any proportion of the various sizes may be delivered into a new 200-ton loading bunker erected at the east end of the storage piles. This bunker has two chutes which permit rapid loading directly into a railroad car. The maximum shipping capacity of the plant in the past has been 50 cars per 10 hr. This will be slightly augmented by the present improvements.

A Fairbanks iron-frame track scale, with 50-ft. platform and a capacity of 200,000 lb., is installed a few hundred yards down the track for weighing the cars of crushed rock. The cars come down by gravity from the loading tracks to the scale platform.

Water for the crushing plant is supplied by a 6-in. Goulds deep-well pump driven by a belt from a 50-hp. motor. The water is delivered to two steel tanks, 11 ft. 6 in. diam. by 10 ft. deep, capacity 7500 gal. each, mounted on a timber superstructure 37 ft. above the ground. These supply water to the steam shovel and the railroad engines, and also to a complete fire-protection system. Two steel oil-storage tanks of similar size are mounted on a 25-ft. superstructure, placed midway between the railroad tracks and the steam-shovel tracks. The pipeline from the oil tanks is laid underground and is provided with ground cocks spaced every 80 ft. up to the steam-shovel site. This pipeline supplies fuel oil to the dinky engine and to the steam shovel.

EUCALYPTUS ON DREDGED LAND



STEAM SHOVEL LOADING TAILINGS

THE WASHING PLANT

The new washing plant at Fair Oaks is designed to be operated in conjunction with the rock-crushing plant and to augment the capacity of the latter by eliminating the clayey portion of the feed which has heretofore reduced the capacity of the screens and crushing machines. The old crushing plant, however, may be operated independently of the washing plant when desired. The washing plant was designed, and the equipment supplied, by the Meese & Gottfried Co., 55 Main St., San Francisco. The principal equipment includes: A large cylindrical screen, four conical screens, washing nozzles for all screens, two tilting settling tanks, five conveying belts and a 100-hp. electric motor.

HEAVY ALL-STEEL TROMMEL FOR PRELIMINARY WASHING

All material entering the main receiving hopper at the crushing plant is delivered by the No. 1 conveyor to a 36-in. cross belt that transports the material to the washing plant. Here it is delivered into a hopper where two 5-in. nozzles, using about 1250 gal. of water per minute, force the gravel and water down the hopper into a 5x30-ft. cylindrical revolving screen. This is an all-steel trommel, most of the parts being of cast steel. It has spur-gear drive at each end and is supported on four trunnion wheels, 30x9 in., set in special one-piece bearings. As the screen is unusually heavy, weighing about 50,000 lb., it is equipped with heavy cast-steel tread rings in order to avoid the flattening and stretching that results with rolled-steel tires. The screen is run at 13 r.p.m., giving a peripheral speed of 195 ft. per min.; it is set on a pitch of one inch to the foot and the thrust is taken by a heavy cast-steel bracket and thrust roller, 15 in. in diameter with 5-in. face that bears against the tread ring. The screen is tied together on the outside by five 6x6x¾-in. angles and on the inside there are 1½x2-in. steel bars running the length of the screen to assist in disintegrating the material.

The first four feet of the screen are blank to permit the water and gravel to mix; the next eight feet have 1-in. perforations; the next 14 ft. have 3-in. holes; the last four feet of the screen are blank and here is accomplished the final washing of the boulders by three 3-in. nozzles. The oversize product from this screen (cobbles over three inches in size) are returned by a 30-in. conveying belt to the head screen in the main crushing plant. This conveyor is set at an angle of 10°; the boulders now being washed clean, there is no sand or clay to keep them from rolling as was the case on the receiving belt which operates at an angle of 18°. Conveying belts removing the finer washed sizes are set at an angle of 12 degrees.

THE CONICAL SCREENS

All the water so far used passes with the undersize—clay and gravel, under three inches in size—to a hopper that serves two series of "conical" screens. There are four of these screens, the shells of which are really not cones but frustums of cones; the screens are 84 in. long, and 66 in. and 48 in. in diameter at the respective ends. At the small end the screen is fastened to a cast-iron head into which a 4 15/16-in. driving shaft is pressed and keyed. The head casting is protected by a steel disk, ½ in. thick by 48 in. diameter. The feed to these screens is delivered by a chute on the inside at a point near the 48-in. end; the end of the feed chute is cut off at an angle so that all of the feed is not delivered at one spot on the

screen plate, thus distributing the wear. The screens are run at a speed of 12 r.p.m. On account of the conical shape and the force of gravity, the oversize passes backward and out of the screen against the action of a washing nozzle.

The first two of these conical screens have 1½-in. perforations. The oversize in consequence varies from 1½ to 3 in.; this is taken by conveyor *C* to the conveyor feeding the first corrugated rolls and Symons disk crusher in the main crushing plant, and from that point follows the normal course for such a product. The undersize from the first two conical screens passes to the last two screens which have ⅜-in. perforations; the material larger than this size is transported by conveyor *D* to the main crushing system, or when desired, may be sent directly to stockpile.

The Washed Gravel and Silt

The undersize from the last two conical screens together with the accumulated water passes to two automatic-tilting settling boxes, the washed sand from which is conveyed to the stockpile. The overflow from the settling boxes containing the wash water and silt will flow back to the dredged land from which the cobbles were removed. As the water drains off it will be pumped to the irrigating system serving the adjacent orchard lands of the company. The discharge of the water and silt from the settling boxes of the washing plant will be carried away by a 2-ft. semicircular steel flume made of No. 16 galvanized sheets in 16-ft. sections. It will be strengthened by side angles, $1\frac{1}{2}x1\frac{1}{2}x\frac{3}{16}$ in., and tied with 3-in. channels at every eight feet.

Water for the washing plant will be supplied by a 10-in. Advance, two-stage, vertical, centrifugal pump operating at 150-ft. head—directly into the washing-plant system, through a 14-in. riveted pipe 1600 ft. long. The capacity of the pump is 2500 gal. per min. at 600 r.p.m., though it is expected that only about 2000 gal. will be required at this plant.

It is expected that the washing plant will be capable of washing about 3000 tons of cobbles in 10 hr. and that by the removal of the clay and fine gravel, it will increase the capacity of the screening and crushing machinery in the main crushing plant at least 40 tons per hr., and possibly a much greater amount.

Products Mainly Used for Road Building

The products from the crushing plants are chiefly used for making concrete and road building, the latter being the most important market. They are also used by the railroads for ballasting and filling and for "top dressing" around stations. Natomas last year secured a contract from the State of California for 500,000 tons of macadam to be used on the new state roads, two of which are to be built from north to south through the state. These new state highways involve the construction of about 2700 miles of road, one of the highways running near the coast and the other in the valleys farther to the east. The crushing plants of Natomas Consolidated are favorably situated for supplying crushed material for the new roads in the Sacramento and San Joaquin Valleys. It is understood that feeders to the state roads will be built by the various counties so that these road projects, together with the normal increase from ordinary channels of business, offer a market for crushed dredged cobbles for many years to come, and incidentally will provide California with a system of roads that should rival or excel the old Roman highways.

The product of the Natomas crushing plants has been passed upon by the Office of Public Roads of the U. S. Department of Agriculture as an excellent road-making material having been designated as "a hard and tough rock with high resistance to wear and fair cementing value . . . . . a good road material for heavy traffic." With the new washing plant in operation, an even superior product should be produced at the Fair Oaks crusher, and the capacity of the works augmented.

Mineralization in Ungava

Valuable iron deposits and indications of other metals exist in the district of Ungava, recently added to the Province of Quebec as the Territory of New Quebec, according to a report published by the Quebec Department of Colonization, Mines and Fisheries. Gold has not been actually observed, although numerous quartz veins occur. Silver has been found only associated with lead in the limestones of the Cambrian area on the east coast of Hudson Bay. A few occurrences of copper pyrites were observed. Large and promising deposits of magnetite, hematite and siderite occur in various localities. They are always associated with a cherty limestone, the latter being found on the east coast of Hudson Bay, at Lake Mistassini and along the Koksoak and Hamilton Rivers. Analyses of samples taken along the Koksoak River run from 20 to 55% metallic iron, the deposits being extremely variable in quality and large areas of high-grade ore apparently existing. The deposits along the Hamilton River are of similar grade and nature. In the Hudson Bay areas most of the ore is of the carbonate variety but high percentages of manganese are found there. Large deposits of titaniferous ore are found in many localities.

Pyrite occurs in various places in different manners. A bituminous mineral called anthraxolite, which has the lustre and color of anthracite and analyzes approximately 5½% water, 2½ additional loss on ignition in a closed vessel, 87% fixed carbon and 7% ash, is found rather widely distributed and is supposed to be the hardened product of a liquid bitumen. Deposits of mica, agate, jasper and labradorite, together with building stones, cement rocks, grindstones and flagstones are also found.

Burkey's Treatment of Brass Scrap

The production of zinc oxide from brass scrap, is described by Harvey M. Burkey, of Newark, N. J., in U. S. pat. No. 1,061,447, assigned to the Metallurgical Co. of America. Brass turnings or brass waste, mixed with fine fuel, preferably fine anthracite coal, are charged in on a fire in a converter, of the Huntington-Heberlein type, either working by pressure or by suction. The zinc is volatilized and passes as zinc oxide into flues, where it is recovered by baghouse or similar means. At the close of the operation a cake of copper agglomerate or sinter, suitable for blast-furnace or reverberatory treatment, is discharged from the pot.

Canvas Plant of the Federal Lead Company

By Claude T. Rice

SYNOPSIS—Description of an installation of canvas tables for concentrating the tailing from other concentrating machines. A substantial additional saving is made. The process is intermittent, collected concentrate being washed off the table with a hose. Low cost of maintenance is a prominent feature of the plant.

In the accompanying drawings are shown the details of the canvas plant of the Federal Lead Co., at Flat River, Mo. Formerly canvas and blanket plants were much used in treating fine sizes of ore, but gradually the vanner and other slime-treating devices have supplanted them to a large extent until only those in California exist, together with a few other scattered installations. Most modern millmen seem to think that canvas tables and buddles are outgrown. But Mr. Guess finds that after he has sent his pulp over fine tables, and much of it twice over vanners, he is still able to make a 40% saving on the 3% lead material fed to the canvas tables. Of course on a galena ore, such as is treated in this mill, a canvas plant possibly will make a better saving than on some of the lighter minerals, such as pyrite or chalcopyrite. The canvas plant, however, is a cheap method for final treatment of slime before it is thrown away.

On a canvas table a fairly clean concentrate can be made, but it is generally better to make one that is not so clean and then re-treat it on tables and vanners. This is the present practice at the Federal plant as it has been found better than making a concentrate running as high as 35% lead and shipping that, after drying, directly to the smelter. The higher the grade of concentrate made on a canvas table, the smaller the saving and the greater the expense, for canvas-plant concentrate is cleaned by washing it free from gangue slime with a hose on the table before sluicing it into the concentrate box.

The Federal canvas plant has 48 tables. The accompanying drawings show the details of the two-story frame building, which is 80x80 ft. in area. The cost of the building with board sides and corrugated-iron roof, fully equipped as shown in the drawings, was only about $8000 with lumber at $22 per M. and carpenters' wages $2.55 per eight-hour shift. The cost of operation is not high, as one boy will wash off 36 canvas tables an hour when making rough concentrate and 24 tables when washing off clean concentrate. A table has to be washed off about once in 20 minutes, the interval depending upon how fast the tables are making concentrate. As soon as the canvas becomes well covered with concentrate, the table ceases to be efficient and must be washed. Boys do this washing easier and better than men.

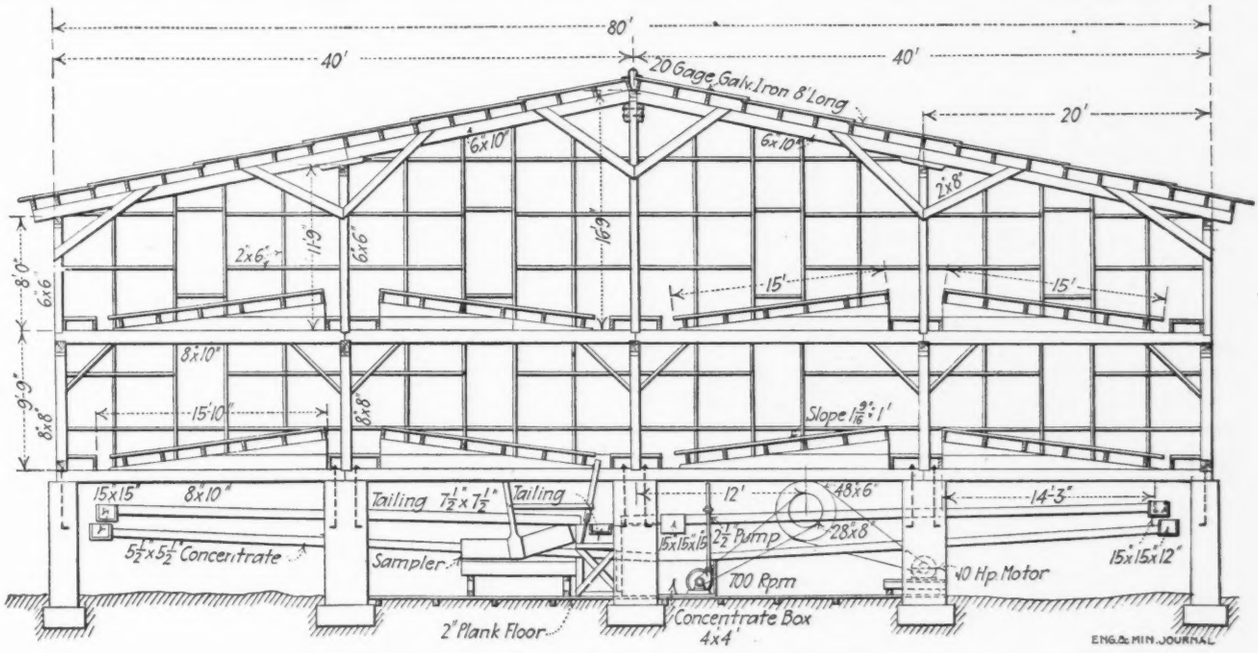


Fig. 1. End View of Canvas-Plant Building

The accompanying drawing, Fig. 2, shows the arrangement of the feed, the tailing and the concentrate launders *A*, *I* and *J*, respectively. The feed for each canvas table is drawn off from the launder *A*, through two pipes *B* that bring it down into the feed box of that table. These feed pipes are shut off best by means of wooden plugs while washing the table, although valves can be used as shown in the drawing. Valves are slower and less convenient.

From the feed box *D*, the feed issues through ½-in. holes bored at 6-in. centers to the distributor *E*. By means of the finger arrangement of the lower lip, as shown in the enlarged view, the pulp is spread out in an even film on the deck *F* of the canvas table. This top is 11 ft. 8 in. wide and 14 ft. long and has a slope of $1\frac{9}{16}$ in. per ft. In covering the table two-ply tar paper is first fastened to the wooden deck with 8-oz. copper

tacks. Over this is stretched 18-oz. canvas, two pieces 6 ft. wide being used. In applying both paper and canvas, butt joints only are used. First the strips are tacked down with 8-oz. copper tacks along the center butt joint, then the canvas is stretched by hand and tacked down on the other three edges. Wooden strips are then nailed over the middle joint, across the top and along the edges. The shrinkage of the canvas when it becomes wet removes all wrinkles.

From the table the pulp flows down to the tailing-box *G*. This has two compartments, one for tailing and the other for concentrate. It is provided with a tilting board, *H*, hinged on the middle partition, by tilting which the pulp is conducted into either of the two compartments desired. When the table is being washed this tilt board is set so as to let the concentrate go into the concentrate launder. By means of cleats it is possible to arrange the tilt board so that no hinges are required.

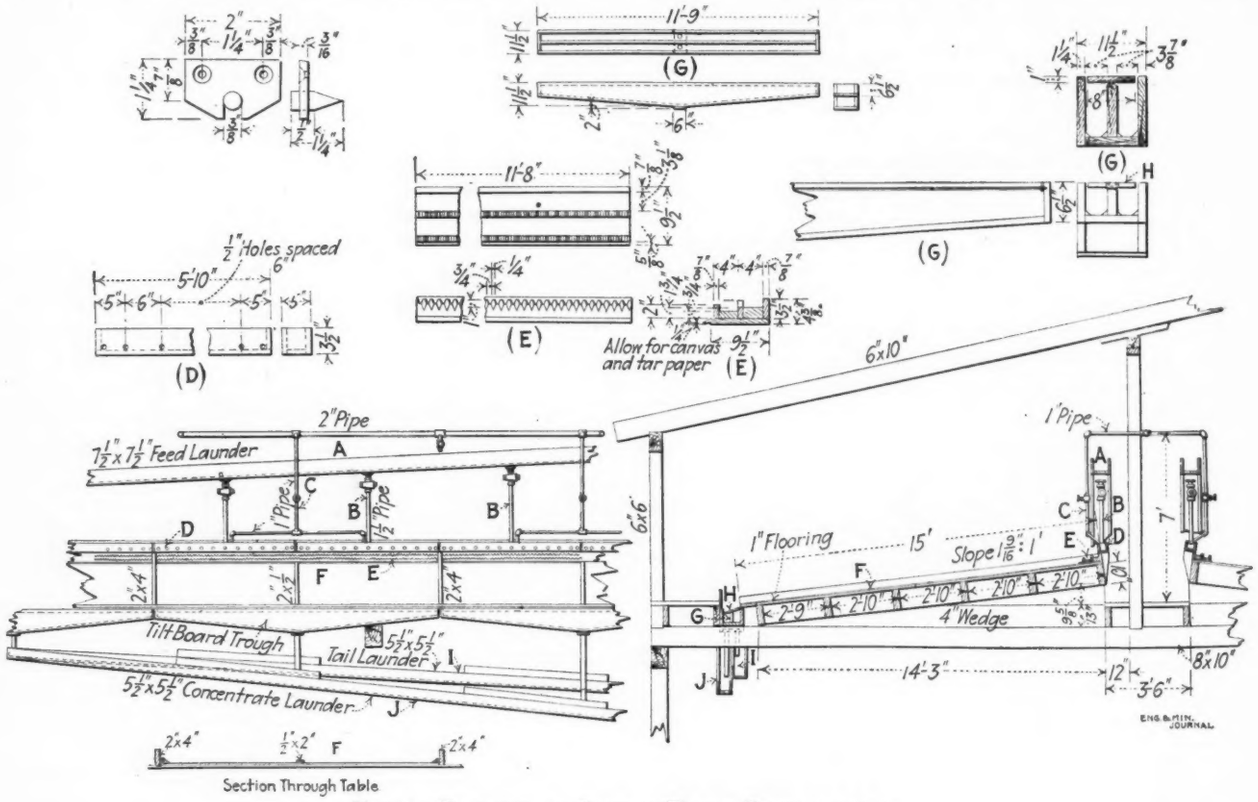


FIG. 2. DETAILS OF CANVAS-TABLE INSTALLATION

The washing of the concentrate is done with a hose, one hose serving four tables. The water comes from the same pipe that is provided to dilute the pulp in the feed box. Mr. Guess has found the proper consistency of pulp to be 15 parts of water to one of dry slime by weight. The hose may be fitted with an appropriate nozzle when the concentrate is to be dried for shipment as in this way it can be discharged with a minimum of water, but when the concentrate from the canvas tables is re-treated on Wilfleys and vanners, no sluicing nozzle is required, as the attendant gets his sluicing jet by pinching the end of the hose between his fingers.

About the only upkeep on the tables is the canvas, as the rest of the material lasts several years. At the Federal mill the canvas on the tables has a life of about eight months. During the first few weeks, when the fuzz is on the fibers, the canvas is more efficient than later in its life. It was this consideration that led to the use of concrete "planillas" at the Pinguico mill at Guanajuato in Mexico instead of canvas tables. But this falling off in efficiency is not marked, and a canvas surface is probably better for doing close work, in a plant built primarily for concentration, and not just for roughly catching the sulphide particles to keep them from interfering later in the cyanide treatment of the pulp. One of these canvas tables, 12 ft. wide will treat in 24 hours about 100 to 120 tons of pulp containing about 81% moisture. A good general rule for estimating the capacity of canvas tables is 1½ gal. per min. per ft. of width of canvas with a normal flowing pulp, or 18 gal. per 12-ft. table per minute. The flow must be such that there are gentle crescent ripples formed as the pulp flows down the table, yet no sluicing action. The length of the table depends upon the richness of the feed and the slope.

Diamonds in Arkansas

Diamonds were first discovered in Arkansas Aug. 1, 1906, near the mouth of Prairie Creek, in the vicinity of Murfreesboro, Pike County, and since that time approximately 1375 stones, aggregating 550 carats, are reported to have been found in this locality. The diamonds in Arkansas occur in peridotite, and search for further areas of the rock has been made. Three new areas have been found, the known extent of which is much smaller than that near Murfreesboro. They lie within an area of one square mile, about 3 miles from Murfreesboro. These localities were visited by Hugh D. Miser, of the U. S. Geological Survey.

At this time the Kimberlite Diamond Mining & Washing Co. was erecting at Kimberley a plant to wash the diamond-bearing earth to be hauled on a tramway from its peridotite area and from another tract near the mouth of Prairie Creek. Four diamonds of good quality are said to have been picked up on the surface, the largest weighing 4 carats. Further development work to ascertain the extent of the peridotite is now under way. On another tract, where a little washing for diamonds has been done in a crude way without machinery, 20 diamonds have been recovered.

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New Mogul Mill in Black Hills

By Jesse Simmons*

Gratifying progress is being made by the Mogul Mining Co. of Terry, S. D., in the construction of its new plant in Nevada Gulch, and it is within expectation that the mill will be crushing ore by the end of the year; its capacity will be 150 to 200 tons per day. For more than one year the Mogul has been without milling facilities, a fire having so severely damaged the plant at Pluma in March, 1912, that the company took no steps to rebuild on that site. After considerable research work it was decided to rebuild at a place more convenient to the mine, and the site near the Snowstorm mine was selected. Low-grade ore which could not profitably be shipped to Pluma can be treated when milling is resumed.

Practically all of the crushing and grinding machinery for the new mill will be salvaged from the Pluma plant. The Pluma plant also contained tanks which can be utilized, and the warehouse and machine shop, which were not reached by the fire, contain much uninjured machinery, repair parts, supplies and the usual supply of tools found in a small machine shop. With these, the engineers estimate that the new plant will cost $46,000. It is also planned to spend $8500 for mine development and equipment in order to make the mine workings convenient to the mill. The trustees for the bondholders have collected $73,280 fire insurance, and have agreed that current expenditures may be made from this money.

Ore supplies for the new plant will be drawn from the North Lode, Carstreet and Black Moon, in which it is stated 48,000 tons of ore are in sight, the Mark Twain, Sunnyside No. 1, Ben Hur, White Pine, Hardscrabble and others. Gyratory crushers, rolls, chilean mills and Dorr classifiers will be installed. Continuous decantation and counter-current treatment of slime, using Dorr thickeners, and eliminating the filters used in the old plant, will be practiced. As the first plant in the Black Hills to use this process without a filter, its operations will be closely watched.

*Deadwood, S. D.

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Chilean Government to Control Mineral Deposits

A new law has just been passed by both branches of the Chilean Congress which suspends the old mining code indefinitely, according to *Daily Consular and Trade Reports*, Aug. 30, 1913. It is said to be the result of heavy American investments in copper and iron mines during 1912 and 1913, which represent an investment of $15,000,000 to $20,000,000 when the plants have been completed. The important provisions of the new law are included in the following abstract:

(1) During the time the right of individuals to denounce iron mines is suspended, the State shall be authorized to make the necessary declaration and inscription of such deposits. (2) Such claims to have the superficial dimensions decreed by the President of the Republic, and possession to be taken in the usual way provided in case of individuals by the mining code, though the State shall not be obliged to start work within the term laid down in such cases. (3) The rights thus acquired by the State shall be in perpetuity, and no license or other rates shall be paid. (4) The mensuration and establishment of titles to be undertaken by the mining section of the Direction of Public Works. (5) All iron mines the property of individuals the rights to which shall lapse through nonpayment of the necessary taxes shall revert directly to the State and shall not be sold by auction as provided in the mining code. (6) The President of the Republic is authorized to establish the regulations necessary for carrying out this law.

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Rock-Drill Lubrication

It is essential for the satisfactory working of a rock drill that it be well lubricated. This is particularly true of the rapid-stroke hammer drills. It is a fact sufficiently well recognized by both manufacturers and managers, but it is a fact exceedingly hard to impress on the consciousness of the average miner. The Journal has been engaged in correspondence to ascertain what are the most acceptable and successful methods of lubricating air-actuated rock drills, with results which we present herewith.

The main problem in most cases seems to be getting the miner to lubricate his machine at all. Economy in the use of lubricants is a matter of consideration by some companies, but not by all. To induce the miner to attend to lubrication, it is customary to supply him with an oil flask, usually a pocket-flask and to maintain sufficient supplies of oil at convenient points so that he will have no excuse for not oiling his machine.

The miner who does oil his machine usually prefers to put in a large amount of oil at rather infrequent intervals. He does this by disconnecting his hose, and oiling through the hose connection. It is probably not bad practice to put in an extra charge thus at the beginning of the shift, as the machine may have lain idle for some time, possibly rusting slightly or gumming so as to stick. It is, however, a wasteful method of lubrication. One practice which sometimes obtains is to be condemned in the strongest terms, that of putting the charge of oil in the hose where it is attached to the air pipe. This is done to distribute the feeding of the oil over a considerable period of time, as it has to be carried through the hose before reaching the drill. It is questionable whether this result is obtained; the injurious effects on the rubber hose are unquestionable. The mineral oil disintegrates the lining, ruins the hose and allows small pieces of rubber to get loose and lodge in the drill valves so as to cause trouble.

Most modern machine drills come equipped with some sort of lubricating device. There are also numerous automatic and semi-automatic lubricators on the market which can be applied to the connection between the hose and the machine. When the miner can be induced to use these, there is a substantial saving in oil consumption and a much more satisfactory lubrication of the drill.

The most commonly employed principle involves an attachment to the throttle valve, which injects a certain amount of oil every time the machine is stopped and started. Usually this is done by arranging ports in the throttle so that when the machine is stopped, a small amount of oil is forced into an auxiliary chamber of the device and when it is started, the main air flow is directed through this chamber and shoots the oil into the machine. The system is correct in furnishing a small quantity of oil at frequent intervals and it is reported by many companies as proving most satisfactory in practice. The proof of the pudding is chewing the strings; nevertheless, the method is incorrect in theory, inasmuch as the quantity of oil fed varies inversely more or less as the time that the drill is running. That is, the greater the number of stops, the greater the amount of oil fed and yet, at the same time, intermittent running usually means a smaller total of actual running time.

A system absolutely correct in principle is employed by at least two large manufacturing concerns on most or all of their drills and is reported by one mine as being satisfactory except for feeding too rapidly. It consists of inserting in some convenient and otherwise unoccupied portion of the machine an oil chamber feeding into the valve chest and so arranged usually that the oil traverses a plug of porous material which filters it. The oil in the chamber is alternately under pressure and suction caused by the pulsations of the air and for each stroke a minute quantity of lubricant is pulled through the valve.

Various Devices Used to Compel Oiling

A variation of this system involves the use of a number of cartridges of porous material capable of absorbing oil. The cartridge is placed in a special lubricating chamber and gives up its oil under the effect of the air pulsations. The miner, on going on shift, is given a sufficient number of such cartridges to oil his machine for a shift and on quitting, returns them dry as evidence of the machine's being oiled, there being no other way of extracting the absorbed oil except in the machine. Such a scheme, if proved practicable in use, offers the great advantage of compelling the miner to attend to lubrication.

A somewhat similar system suggested by the mechanical engineer of one large mine is to use the combined throttle and oiler previously mentioned, giving it filled with oil to the miner when he goes underground, and requiring its return when he comes up. Since it could be made impossible to operate the machine without the throttle, lubrication would take care of itself unless the miner deliberately emptied the oiler before connecting up. An objection might arise when it became necessary to change machines and take a spare one from underground, which might have its throttle-oiler empty. This could be met by making the throttle part of the miner's equipment so that when he changed machines he could put his own throttle on the new machine.

It has been suggested that the question of lubricating be taken out of the hands of the miner entirely by feeding the proper amount of lubricant to the air main as soon as it is sufficiently cooled after leaving the compressor. This would be entirely feasible; its results cannot be prognosticated. Undoubtedly for most of the time the machines would receive their oil slowly and the quantity would be proportioned to the work done. However, the increase in oil consumption might be considerable, a rather large amount would be necessary to coat all the air pipes in the first place and the oil in the air used for blowing smoke would be wasted. If it were attempted to prevent this by shutting off the oil feed at the proper time before blowing began, the drills would not be supplied immediately with lubricant at the time of starting on the next shift. The proper times to stop and renew the oil feed would be hard to determine. Furthermore, the oil being atomized might be capable of forming an explosive mixture with the air of which the introduction underground would be as dangerous as that of gasoline.

The question of the kind of lubricant used is of equal interest with that of its means of application. The testimony of most operators seems to favor a red engine oil as giving the best combination of quality and price. Air-cylinder oil is recommended but is considerably more expensive. The most important point is to avoid gumming the machine. For this reason, heavy oils are not suitable. Nevertheless, in one case, a black oil is used in tappet-valve piston machines. The same company uses the automatic device mentioned, which feeds by the air pulsations and in this device uses an oil of rather high viscosity, No. 2 Castor, which, however, appears to contain much fish oil and no castor oil. Special oils for rock drills are also on the market.

No Economy to Save on Oil

At many mines, as before stated, effort has been made to encourage the use of lubricant rather than to reduce consumption. Where record of consumption is kept, the figures check rather well. One property reports 0.3 pint per machine shift, another 0.5 pint, the latter figure being a reduction of 50% following the introduction of a throttle-oiler, and corresponding to a saving of 3c. per machine shift, beside large indirect savings in repairs and replacements. Another property reports a consumption of slightly over a pint per drill-shift, except in the case of Water Leyner machines, which consumed about a quart. It is current comment among miners that the Water Leyner requires an unusual amount of lubrication, attributed to the tendency of the water connection to leak and wash out the lubricant. The clothes of the Leyner drill runner, judging by appearances, absorb a large amount of the surplus.

It seems to be the general consensus of opinion of mine managers and drill manufacturers that satisfactory lubrication of rock drills is difficult to obtain, highly important and too much neglected. Some automatic or semi-automatic oiling devices effect both direct saving in lubricants and indirect economy in promoting steady operations and low repairs. A red engine oil is the accepted lubricant. Consumption can be kept to 0.5 pint per drill shift or less.

For the information in this article, the Journal is indebted to the Ingersoll-Rand, Sullivan and Cleveland drill companies, and to the North Star, the Goldfield Consolidated, the Calumet & Arizona, the Hollinger and the Cleveland-Cliffs mines.

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European Phosphate Production, as given by the president of the Gafsa Phosphate Co. is as follows: In 1900, 1,645,000 tons, of which Gafsa supplied 171,000, and America 600,000; in 1905, 2,560,000 tons, Gafsa contributing 624,000 and America about 950,000 tons; in 1910, 3,400,000 tons (Gafsa 950,000 and America 1,100,000 tons); 1912, 4,183,000 tons (Gafsa 1,312,000 tons). It is, however, improbable that this rate of growth will be maintained in the future.

The Magistral District, Jalisco, Mexico

By Ezequiel Ordoñez*

SYNOPSIS—Description of an old Mexican district, the copper ores of which were used to manufacture a crude copper sulphate. This chemical was necessary in the patio process of amalgamating gold and silver ores. The district is named for the chemical. It is now undergoing systematic development.

Magistral, a well known copper district, is situated a few miles southwest of Ameca, Jalisco, Mexico. It is connected with Guadalajara by a branch of the National Railways of Mexico. Although its copper-bearing veins have been known for a long time, no large mines have been developed. Small mines of varying importance and a great number of prospect pits are scattered throughout the supposed mineral territory. The first work done on these deposits was to get, either through the weathering of crude ore, or of previously roasted ore, the copper sulphate so necessary in the treatment of silver ores by the patio process. These impure sulphates were called *magistral,* from which the name of the district has been derived. It is said that *magistral* from this district was packed on animals as far as Guanajuato.

Outcroppings in the district show large quantities of iron oxides, but they show but very little copper carbonate, and at slight depth both pyrite and chalcopyrite are found. These conditions facilitated the operations of the makers of *magistral* in that they were not compelled to go far underground for ores suitable for their purpose.

Magistral District the Corner of a Large Copper Belt

Considered individually, the Magistral district, as known to date, is not extensive. The six or seven principal veins are more or less parallel and strike in a northwesterly direction for a distance of two or three kilometers. All lie within a strip not more than two kilometers wide. It is apparently the northeastern extremity of an extensive copper belt which extends to the southwest as far as the Pacific Coast range of the Sierra Madre, and upon which the Ayutla, San Martin, Union de Tula and Cacoma districts lie. These districts have been mentioned recently as showing copper ore in small bunches as well as in broad gossans of distinct prospective value. Little is known about this long copper belt, as no important development has been undertaken as yet, and the belt will be handicapped for a long time on account of lack of transportation facilities through mountainous country.

The district lies in a hilly, though widely opened, eroded depression between two ridges, which, starting from near the summit of the lofty peak called La Tetilla (2800 meters above sea level), lead to the east. The flanks of this mountain are covered with a thick sheet of basaltic lava, patches of which are also seen within the eroded depression, as remnants of an original inclined plateau which previous to erosion uniformly surrounded the peak. Its copper deposits may be compared in general geological outline to those occurring entirely in intrusive rocks. Such deposits occur in the Sierra Nevada range of California, in Idaho, and in some parts of New Mexico, while those of Butte, Montana, are typical of the class. The predominant country rock of the Magistral district is a large body of diorite, showing a wide variation in physical structure and character. This variation is from a coarsely grained diorite on one end, to an evenly grained micro-diorite, with frequent changes to porphyrites, on the other.

This varied country rock is cut in several places by thick dikes of quartz-porphyry. The veins occur on or near the contact of these dikes with the diorite and almost parallel to them in strike. The veins show in several places, especially near the surface, indications of their being fractures filled with quartz and rock fragments.

The deposits are generally closely connected with ancient fault-planes, along which quartz, with pyrite and varying amounts of chalcopyrite, seems to have impregnated the brecciated zone of the fault, replacing the country rock on one or both sides. Due to intense silicification, the original rock may be identified in ores of all grades, from a purely quartzose mass to hard fragments. It is not uncommon to find pyrite occurring in small masses or grains in the comparatively soft, altered, greenish rock of frequent occurrence in a number of copper districts. In so far as is at present known, the dikes have exerted no apparent influence on the veins and the mineralization has not been found to extend through the dike rock.

Outcrops of the Magistral veins, well marked and in some cases prominent, consist of silicified diorite, occasional quartz stringers and specular hematite. No true gossan exists, but in several instances iron oxides are abundant, these being accompanied with more or less copper ore. The old workings are naturally located on these outcrops, for instance, the mines of Magistral, Cerritos, Zapote, etc. However, even at these places the copper ore has never been sufficient for large production. Small lenses containing scattered bunches or small masses are the common form of ore occurrence, even to depths of 200 to 300 ft. below the surface. Near the surface the ores were so scattered that the makers of the *magistral* were compelled to resort to a careful and painstaking sorting in order to obtain ores clean enough to warrant the necessary roasting.

Copper veins of the district vary from 4 to 25 ft. in width, the bodies always being lenticular in shape, and sometimes many feet apart. Between the lenses the vein can be followed only by the fault-planes or by narrow stringers of quartz with altered rock containing pyrite and disseminated grains of chalcopyrite. Vein junctions seem in general to be favorable to ore deposition. One of the best examples observed is in the Magistral mine, where a junction of three veins has caused the formation of a series of ore lenses. Similar instances occur in the Cerritos open-cuts and in the old Timones mine. There are six principal veins in the district, known as the Magistral veins. They are composed of several subsidiary veins close to a large dike. Following to the southeast, there is the Hondo and another vein near it, then the Timones, Monterrey and La Union veins.

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In addition to the Magistral, which is the principal mine of the district, there are three other small mines, the Timones, Zapote and Cerritos; this last at present being worked on a small scale. The Zapote and Cerritos mines are about 300 ft. deep, and the Magistral 400 ft. None of them has been extensively worked. A new lens has been recently found in the Magistral, which is now being exploited. The Magistral company is operating a concentrator with a capacity of 50 tons per day, which is to be increased to 100 tons in the near future. The company erected, some time ago, an involved plant for concentration by jigging as well as a small flotation unit, but the results were disappointing and it was considered that concentration was difficult if not impossible. Recently, however, changes were made in using the original crushing plant. The ore is crushed through three-stage rolls to 14 mesh and the entire pulp passed over Isbell concentrators. The middling from the Isbell tables is recrushed in a small tube mill and passed over Wilfley tables, which effect a further saving. This plant has demonstrated that concentration gives excellent results.

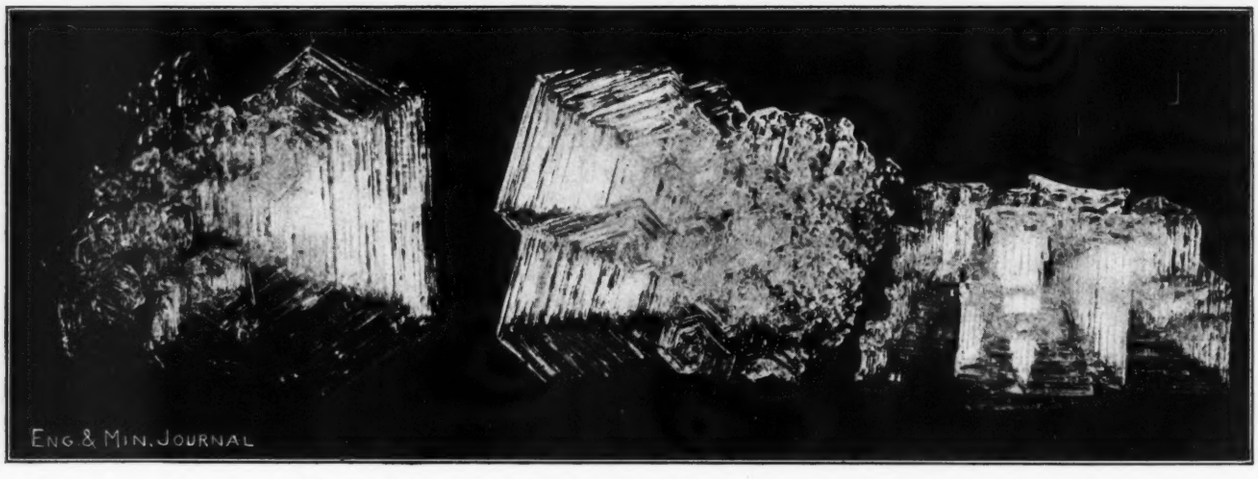
A study of the Magistral district is of broader interest than is indicated by the limited territory covered, for the reason that it is representative of most of the districts included in the long copper belt of which it forms a part. Further development may disclose important deposits.

Frost Crystals Formed Underground

By C. B. Neiswender*

The Moose mine is situated in the Alma mining district of Colorado on Mount Bross, at an elevation of 11,700 ft. At this lofty altitude snow covers the ground for 10 months of the year, and during the remaining two months intermittent snow storms keep the temperature extremely low. For this reason the mine workings were all in frozen ground and stopes of large proportions were excavated with no supporting timbers. Several adits were driven from the surface at different levels in rather a blind search for orebodies, and these openings are connected by means of stopes. Ore was discovered in 1871 and mining was active until 1880.

In the summer of 1911 a party of which I was a member made an examination of the mine for the Colorado Geological Survey. In measuring the extent of the old orebodies our work took us into the abandoned stopes in the extreme bottom of the mine. In the deepest accessible stope a truly wonderful sight was presented, the walls, roof and floor of the large stope being completely covered with a growth of enormous frost crystals. As we flashed our acetylene lamps around the room, these marvelous structures reflected millions of rays, with an effect of surpassing beauty.



Frost Crystals at the Moose Mine, Near Alma, Colo.

Individual crystals were found which measured 5 or 6 in. across. They formed in the hexagonal system, as is evident from the illustration. By the process of forming successive layers they assumed a thickness of from 1 to 2 ft. They had been forming for over 20 years, since the stope in which they were found was abandoned when the mine closed down some time in the '80s. When the aggregations of crystals became of such weight as to be unable to support themselves from the roof, they fell to the floor of the stope and there formed a deposit at least 3 ft. in depth.

The Moose mine is essentially a dry one, the only water present being the small amount which runs in through the adits in summer time. Since the mine is in permanently frozen ground the precipitation of snow and rain is disposed of either by surface run-off or by shallow absorption, and does not reach to any consider-

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United States Asbestos Production

Domestic production of asbestos in 1912 came from three states: Georgia, Vermont and Wyoming. The Georgia production was of the amphibole variety and that of Vermont and Wyoming, serpentine. The quantity was 4403 short tons in total. The United States production is insignificant compared with that of Canada, which amounted in 1911 to about 127,000 tons, according to information published by the U. S. Geological Survey. Canada is the most important producer of asbestos used in the United States.

In Vermont there is a large quarry and mill production of cross-fiber chrysotile. Virginia deposits are mainly slip-fiber amphibole, idle at present. The Georgia deposits are also amphibole, as are those of Texas and the prospects of Arizona, Idaho and California.

able depth. It is, therefore, obvious that the crystals found are of the frost variety and were formed from atmospheric moisture drawn into the old stopes through the different openings.

Hardinge Mills vs. Chilean Mills*

The Hardinge conical pebble mill made its appearance shortly after the plant of the Miami Copper Co. was designed in 1909. Its possibility as a suitable crushing device for the plant was recognized, but in view of the lack of demonstration of its capacity, efficiency for the product desired, and the still more uncertain factors of cost of maintenance and power consumption, it was considered that its immediate adoption throughout the plant would be dangerous.

It was decided to equip the majority of the immediately required units of the plant with chilean mills, the fine-crushing qualities of which were better known, and one section with Hardinge mills, to serve as a test unit for the guidance of future installations and replacements. After 1.5 years' operation with both types, a test of metallurgical efficiency and cost economy has been obtained.

High-Speed Chilean Mills Used

The conical mill used in the test is the 8-ft. Hardinge pebble mill having a cylinder 22 in. in length. The cylindrical portion is lined with cast-iron plates, and the conical extension with silex brick, bound together by cement. Each liner plate carries a projecting lifter, the function of which is to increase the height of drop of the lifted material. Danish No. 5 coast pebbles are used for grinding. The chilean mill is a fast-running three-roller, 6-ft. Saturn mill with screens of 0.037-in. opening. The feed to these mills is the oversize of Callow screens having 0.029-in. openings, which follow rolls crushing to 0.5 in. The ore is a moderately hard but very fissile schist, impregnated with finely disseminated granular chalcocite. It may be regarded as a readily-sliming ore.

Hardinge Mill Believed Better

For the purposes of this plant the Hardinge mill has shown itself more satisfactory than the chilean. With the chilean mills the delays amounted to 0.57% of the time for screen changes and 1.54% for repairs. Corresponding delays with the Hardinge mill are 0.71% for relining and 0.58% for repairs.

It will be seen that most of the delays of the Hardinge mill are due to relining, a point which is susceptible of reduction by having on hand extra shells already lined, which can be swung into place of the worn-out ones by a crane, reducing to about 2 hr. the operation, which in lining the mill in place, would take about 48 hr. It is said that less actual attendance is also required for the Hardinge mill, making it possible to reduce the operating cost in plants where the duty of the attendants can be distributed so as to include the supervision of other apparatus. Occasional pebble feed, lubrication and a lookout for obstructed discharge boxes are the only services required.

Because of the granular character of the chalcocite of this ore, it is the object to make a product of such size as to liberate the maximum mineral content with as little slime as possible. It has been found that that a product which contains a maximum percentage between the sizes of —60 and +200 mesh is the best. In Table I is given a typical screen analysis of feed and product for both types of mills. From this it is seen that the Hardinge mill yields 37% of the desired size of the material, or about 50% more than the chilean mill, accompanied by less slime. The Hardinge mill is said to consume less power. At this plant a 150-hp. induction motor operates three 8-ft. Hardinge mills or two 6-ft. chilean mills, and the power consumption is, on the actual feed tonnage, for the chilean mill, 10.7 hp.-hr. per ton, and for the Hardinge mill, 9.6 hp.-hr. per ton. An important feature brought out by the comparative operation of these mills is the difference in duty exacted of the cone tanks. The sections of the plant operated with Hardinge mills have shown an average reduction of nearly 75% in the solid feed and 40% reduction in the water feed to these tanks as compared with the chilean mills. This is to be attributed to the combined results of the smaller quantity of water fed to the grinding mill and of the smaller production of slime.

TABLE I. COMPARISON OF WORK OF CHILEAN AND HARDINGE MILLS

	Chilean		Hardinge	
Mesh	Feed	Product	Feed	Product
+4	13.9	0.0	12.9	0.0
+10	47.5	0.0	47.3	0.0
+20	22.9	2.3	26.8	0.2
+30	5.2	11.8	5.0	3.2
+40	0.9	6.7	0.8	4.9
+60	1.0	11.4	0.8	13.8
+80	0.5	6.7	0.4	10.4
+100	0.4	5.4	0.3	8.6
+150	0.5	6.3	0.3	8.0
+200	0.7	7.2	0.5	10.0
—200 sand	1.2	10.6	0.8	10.0
+200 slime	5.3	31.6	4.1	30.9

Low Maintenance Cost of Hardinge Mills

The maintenance costs of chilean and Hardinge mills are shown in Table II. The cost for each mill is based on crude-ore tonnage, so that the cost per ton of actual feed would be 40% greater than that shown. In the reduction practice of this plant about 70% of the crude-ore tonnage passes through the fine-grinding mills. From the figures shown in Table II it will be seen that the Hardinge mill, for the practice of this plant, shows a net cost of about 0.05c. per ton less than the Chilean mill. It is to be noted that pebble consumption constitutes 70% of its cost, and the freight on pebbles comprises approximately 50% of their expense in this locality.

TABLE II—MAINTENANCE COST OF HARDINGE AND CHILEAN MILLS

Chilean Mill			Hardinge Mill		
Tons Milled 826,000					
Driving mechanism	Cost per ton				
Shafts, pinions and gears	$0.00230			$0.00036	$0.00036
Spindles, muller bushings, etc	0.00275				
Miscellaneous	0.00042				
Crushing mechanism		$0.00547			
Dies (12,910 tons per die)	0.01079		Liner plates and lifters	$0.00403	
Tires (7310 tons per tire)	0.00987		Silex	0.00300	
Screens (183 tons per screen)	0.00176	0.03135	Cement	0.00050	0.00753
			Pebbles (2.51 lb. @ $0.013)		0.03262
			Miscellaneous		0.00012
Total supplies		$0.03682			$0.04063
Repair labor		0.00841			0.00268
Shop expense		0.00543			0.00214
Total maintenance cost		$0.05066			$0.04545

*Abstract of a paper by Robert Franke, Miami, Ariz. Bull. A. I. M. E., July, 1913.

The item of shafts, gears and pinions is probably somewhat low, in that these mills have not been operated sufficiently long to obtain a true average. Nevertheless, this part of the cost is small since the gears have a long life and constitute but a small percentage of the total.

The most important factor of the lower cost of the Hardinge mill is its low rate of depreciation. The wear on its shell, if proper care is taken and the lining is not allowed to wear through to it, seems negligible. Six chilean mills have shown an efficient life of 826,000 tons, making the rate of depreciation, inclusive of transportation and installation costs about 3c. per ton. Allowing a length of 10 years for the Hardinge mill, its depreciation cost would be less than 0.5c. per ton. Summarizing these factors, the net gain in cost by operating with the Hardinge mill for the practice of this plant shows, labor, 0.5c., and power (0.6 kw.-hr.), 0.75c., or a total of 1.25c. Adding to this maintenance, 0.5c., and depreciation, 2.5c., the total saving would be 4.25c. Other advantages which may be mentioned are the greater capacity by reason of low power consumption and fewer delays, superior product, enabling a better extraction to be made; smaller water consumption; and for minimum slime practice requires less dewatering equipment.

It is said that this mill is not out of the experimental stage, and there are possibilities of still better performances. For instance, by lengthening the cylinder of a 6-ft. middling recrushing mill from 22 to 38 in., it was found that the capacity of the mill was doubled, power consumption lessened and the pebble cost decreased to nearly one-half. It would seem, however, that this idea can be carried too far, for the more the cylinder of the mill is lengthened the more it tends to approach a tube mill and so become a slimer. For regrinding middling, however, this variation mentioned is a step in the right direction in that liberation of occluded mineral necessitates a fine product. Large percentage variation in the sizes of feed seems to have a considerable influence on the consumption of pebbles, as it was found in a test in which all the feed was sized to 2.5 mm. that the pebble consumption was 1.85 lb. per ton of actual feed as against the consumption of 3.60 lb. with the oversize feed shown in Table I. Experimental variations in the speed, in dilution of the feed and in size of pebble charge may lead to further economies.

Crushing Efficiencies by Del Mar's Method

An interesting comparison, which, while based on rather ideal assumptions, is so decisive in result as to be given credit, is the mechanical crushing efficiency of the machines determined by the method of calculation discussed by Algernon Del Mar in his article on "The Mechanical Efficiency of Crushing."[1] These calculations as shown in Tables III and IV are based on Rittinger's law that "the work done in crushing is proportional to the reduction in diameter." This assumes that all surfaces exposed give the same unit resistance to crushing, whereas it is to be inferred that there are some surfaces which, by reason of inherent fissility of the ore, offer a lower unit resistance than surfaces not so favored. In view of the large number of surfaces produced, it would seem reasonable to assume that an average unit resistance to crushing will prevail in a not unduly long test. Furthermore, since in these calculations both machines are treated equitably with regard to the practical variations which do not enter into the law, the comparative results can be considered fairly reliable.

Table III shows the crushing efficiency without regard to quality of product made, from which it is seen that the units of reduction performed by the Hardinge mill exceed those of the Chilean mill by from 18 to 23%, depending on the degree of accuracy obtained in the assumptions made in the calculations, and considering 5% as a safe limit. This indicates that the Hardinge mill converts more of the power consumed into reduction of the charge than does the chilean mill. Table IV shows the comparative crushing efficiency with regard to size of product.

TABLE III. MECHANICAL CRUSHING EFFICIENCY—HARDINGE VS. CHILEAN MILLS

		Hardinge				Chilean			
Mesh	Reciprocal of Average Size	Feed %	Relative Surface in Feed	Product %	Relative Surface in Product	Feed %	Relative Surface in Feed	Product %	Relative Surface in Product
+4	4.1	12.9	53	0.0	....	13.9	57	0.0	....
+10	7.2	47.3	341	0.0	....	47.5	342	0.0	....
+20	18.3	26.8	490	0.2	4	22.9	419	2.3	42
+30	37.7	5.0	189	3.2	121	5.2	196	11.8	445
+40	58.4	0.8	47	4.9	286	0.9	53	6.7	391
+60	83.6	0.8	67	13.8	1154	1.0	84	11.4	953
+80	138.0	0.4	55	10.4	1435	0.5	69	6.7	925
+100	163.0	0.3	49	8.6	1402	0.4	65	5.4	880
+150	220.0	0.3	66	8.0	1760	0.5	110	6.3	1386
+200	303.0	0.5	151	10.0	3030	0.7	212	7.2	2182
—200	400.0	4.9	1960	40.9	16350	6.5	2600	42.2	16880

SUMMARY

	Hardinge	Chilean
Units of work in product	25,552	24,084
Units of work in feed	3,468	4,207
Units of work done by mill for uncorrected capacity	22,084	19,877
Units of capacities of 2.50 and 2.25 tons per h.p.-day respectively	55,210	44,723
Excess unit of work done by Hardinge mill		108.47
Excess efficiency, assuming method correct		23.45%
Excess efficiency, assuming 5% as limit of error		18.45%

TABLE IV. SCREEN SIZE CRUSHING EFFICIENCY—HARDINGE MILLS

Mesh	Reciprocal of Aperture	Feed Cumulative per cent.	Relative Surface in Feed	Product Cumulative per cent.	Relative Surface in Product	Relative Surface Produced
4	4.9	87.1	427	100.0	490	63
10	13.3	39.8	529	100.0	1330	801
20	29.4	13.0	382	99.8	2934	2552
30	50.5	8.0	404	96.6	4878	4474
40	66.7	7.2	480	91.7	6116	5636
60	115.0	6.4	736	76.9	8844	8108
80	147.0	6.0	882	66.5	9776	8894
100	182.0	5.7	1037	57.9	10538	9501
150	272.0	5.4	1472	49.9	13598	12126
200	333.0	4.9	1632	40.9	13620	11988
			Chilean Mill			
4	4.9	86.1	422	100.0	490	68
10	13.3	38.6	513	100.0	1330	817
20	29.4	15.7	462	97.7	2872	2410
30	50.5	10.5	530	85.9	4338	3808
40	66.7	9.6	640	79.2	5283	4643
60	115.0	8.6	989	67.8	7797	6808
80	147.0	8.1	1191	61.1	8082	7791
100	182.0	7.7	1401	55.7	10137	8736
150	272.0	7.2	1962	49.2	13462	11500
200	333.0	6.5	2165	42.2	14053	11888

Comparison of Efficiency with Units Corrected for Capacity

Mesh	Energy Units Hardinge	Energy Units Chilean	Difference in Favor of Hardinge	Distribution %
4	158	153	5	0.02
10	2002	1838	164	0.57
20	6380	5423	957	3.32
30	11185	8568	2617	9.08
40	14090	10447	3643	12.64
60	20270	15318	4952	17.18
80	22235	17530	4705	16.32
100	23752	19636	4116	14.28
150	30315	25875	4440	15.41
200	29970	26748	3222	11.18

[1] "Eng. and Min. Journ.," Dec. 14, 1912.

Queensland's Sapphire Production for 1912 was of considerable consequence, according to the annual report of the Under Secretary for Mines. In the Anakie field, the men have been doing remarkably well. A careful estimate of the year's production of gem stones gives it a value of about $161,000, increased by industrial corundum production to about $200,000. This is approximately a 40% increase over the production of the previous year.

Historical Note on Tin Smelting

SYNOPSIS—That tin was well known to the ancients is attested by its occurrence in bronzes, but the source of supply is unknown. There is but little to be found concerning its metallurgy before Agricola, and his description almost fits present Saxon tin smelting.

The first appearance of tin lies in the ancient bronzes. And while much is written upon the "Bronze Age" by archæologists, we seriously doubt whether or not a large part of so called bronze is not copper. In any event, this period varied with each race, and, for instance, in Britain may have been much later than Egyptian historic times. The bronze articles of the IV Dynasty (from 3800 to 4700 B.C., depending on the authority) place us on certain ground of antiquity. Professor Gowland (Presidential Address, Inst. of Metals, London, 1912) maintains that the early bronzes were the result of direct smelting of stanniferous copper ores, and while this may be partially true for Western Europe, the distribution and nature of the copper deposits do not warrant this assumption for the earlier scenes of human activity—Asia Minor, Egypt, and India. Further, the lumps of rough tin and also of copper found by Borlase ("Tin Mining in Spain, Past and Present," London, 1897, p. 25) in Cornwall, mixed with bronze celts under conditions certainly indicating the Bronze Age, is in itself of considerable evidence of independent melting.

To our mind the vast majority of ancient bronzes must have been made from copper and tin mined and smelted independently. As to the source of supply of ancient tin, we are on clear ground only with the advent of the Phœnicians, 1500-1000 B.C., who, as is well known, distributed to the ancient world a supply from Spain and Britain. What the source may have been prior to this time has been subject to much discussion, and while some slender threads indicate the East, we believe that a more local supply to Egypt, etc., is not impossible. The discovery of large tin fields in Central Africa and the native-made tin ornaments in circulation among the negroes, made possible the entrance of the metal into Egypt along the trade routes. Further, we see no reason why alluvial tin may not have existed within easy reach and have become exhausted. How quickly such a source of metal supply can be forgotten and no evidence remain, is indicated by the seldom remembered alluvial gold supply from Ireland. However, be these conjectures as they may, the East has long been the scene of tin production and of transportation activity. Among the slender evidences that point in this direction is that the Sanskrit term for tin is *kastira,* a term also employed by the Chaldeans, and represented in Arabic by *kasdir,* and it may have been the progenitor of the Greek *cassiteros.* There can be no doubt that the Phœnicians also traded with Malacca, etc., but beyond these threads there is little to prove the pre-western source.

The strained argument of Beckmann ("History of Inventions," Vol. II, p. 207) that the *cassiteros* of Homer and the *bedil* of the Hebrews was possibly not tin, and that tin was unknown at this time, falls to the ground in the face of the vast amount of tin which must have been in circulation to account for the bronze used over a period 2000 years prior to those peoples. Tin is early mentioned in the Scriptures (Numbers xxxi, 22), being enumerated among the spoil of the Midianites (1200 B.C.?), also Ezekiel (600 B.C., xxvii, 12) speaks of tin from Tarshish (the Phœnician settlement on the coast of Spain). According to Homer, tin played considerable part in Vulcan's metallurgical stores. Even approximately at what period the Phœnicians began their distribution from Spain and Britain cannot be determined. They apparently established their settlements at Gades (Cadiz) in Tarshish, beyond Gibraltar, about 1100 B.C. The remains of tin mining in the Spanish peninsula prior to the Christian Era indicate most extensive production by the Phœnicians, but there is little evidence as to either mining or smelting methods. Generally as to the technical methods of mining and smelting tin, we are practically without any satisfactory statement down to Agricola. However, such scraps of information as are available are those in Homer, Diodorus and Pliny.

Diodorus says (v, 2) regarding tin in Spain: "They dig it up, and melt it down in the same way as they do gold and silver"; and again, speaking of the tin in Britain, he says: "These people make tin, which they dig up with a great deal of care and labor; being rocky, the metal is mixed with earth, out of which they melt the metal, and then refine it." Pliny (xxxiv, 47), in the well known and much-disputed passage: "Next to be considered are the characteristics of lead, which is of two kinds, black and white. The most valuable is the white; the Greeks called it *cassiteros,* and there is a fabulous story of its being searched for and carried from the islands of Atlantis in barks covered with hides. Certainly it is obtained in Lusitania and Gallæcia on the surface of the earth from black-colored sand. It is discovered by its great weight, and it is mixed with small pebbles in the dried beds of torrents. The miners wash these sands, and that which settles they heat in the furnace. It is also found in gold mines, which are called *alutiae.* A stream of water passing through detaches small black pebbles variegated with white spots, the weight of which is the same as gold. Hence it is that they remain in the baskets of the gold collectors with the gold; afterward, they are separated in a *camillum* and when melted become white lead."

There is practically no reference to the methods of Cornish tin-working over the whole period of 2000 years that mining operations were carried on there prior to the Norman occupation. From then until Agricola's time, a period of some four centuries, there are occasional references in Stannary Court proceedings, charters, and such-like official documents which give little metallurgical insight. From a letter of William de Wrotham, Lord Warden of the Stannaries, in 1198, setting out the regulations for the impost on tin, it is evident that the black tin was smelted once at the mines and that a second smelting or refining was carried out in specified towns under the observation of the Crown Officials. In many other official documents there are repeated references to the right to dig turfs and cut wood for smelting the tin. Biringuccio (1540) gives very little informa-

Note—This is one of the foot-notes from Book IX of Hoover's translation of Agricola.

tion on tin metallurgy, and we are brought to *De Re Metallica* for the first clear exposition.

As to the description on these pages it must be remembered that the tin-stone has been already roasted, thus removing some volatile impurities and oxidizing others. The furnaces and the methods of working the tin, here described, are almost identical with those in use in Saxony today. In general, since Agricola's time tin has not seen the mechanical and metallurgical development of the other metals. The comparatively small quantities to be dealt with; the necessity of maintaining a strong reducing atmosphere, and consequently a mild cold blast; and the comparatively low temperature demanded, gave little impetus to other than crude appliances until very modern times.

New Mine and Metallurgical Construction

Wakota Development Co., at Congress, Ariz., a reorganization of the Coronada Gold Mining Co., is building a 5-stamp mill on the Grasshopper property.

Copper Queen Consolidated Mining Co., Bisbee, Ariz., will build a new cement-copper plant for precipitation of copper from mine waters, and a small test mill for experimental concentration will soon be built.

Balaklala Consolidated Copper Co., Coram, Calif. The hollow-tile stack at this company's reduction works has been torn down. Construction and repair work is in progress, including the installation of machinery for the Hall smoke-eliminating plant.

Ohio Group of Mines, Breckenridge, Colo., is now equipped with a mill, in which Dixon tables are used for concentrating the carbonate ores of the district. Work is now in progress also on the New York group of mines, and a mill will probably be built there later. W. C. Tracy, manager.

El Oro Mining & Milling Co., Elkton, Colo., is in the market for crushing and cyanide machinery, it being reported that a mill will be built.

Co-Operative Mining & Development Co., Reynolds, Idaho, has decided to build a mill of not less than 100 tons daily capacity, at the company's property, Owyhee County.

Harry Butter, East Cambridge, Mass., is to build a new scrap-metal refining plant, at Dorchester, Mass.

Hazel T. Mine, Libby, Mont., is to build a 100-ton concentrator, and has leased a plot of ground to Benjamin A. Blakley, who is also going to build a 50-ton concentrator this autumn.

Nevada Cinnabar Co., Salt Lake City, Utah, is building a 50-ton furnace at its property, at Ione, Nev.

Kinkead Milling Co., Virginia City, Nev., will build a 50-ton mill on the Geiger grade, near Virginia City, to treat low-grade surface ore. The ground has been leased by Walter Techow, from the Sierra Nevada company, for three years. The mill will be built and the enterprise will be managed by W. Techow.

Tonopah Extension Mining Co., Tonopah, Nev., is contemplating the installation of a crusher plant at the new shaft, the installation of a conveyor belt to the mill, and adding 10 stamps and 2 tube mills to the mill, although definite action has not been decided upon.

Elko Mining Co., Jarbidge, Nev., in which Honore Palmer, of Chicago, is interested, will build a mill at the Alpha mine.

John Tilford, Garrison, Utah, will build a small experimental plant for the treatment of tungsten ore at his property, 35 miles east of Osceola, Nev., in the Bonita Mining district.

Nellie Wright, Gold Hill, Josephine County, Ore. This mine is to be equipped with a new mill.

May Day, Eureka, Utah, has completed a mill for the treatment of the accumulation of dump ore, the capacity being 40 tons per day.

British Columbia Copper Co., Ltd., Greenwood, B. C., intends to build a small experimental mill at Boundary Falls, to treat ores from the Lone Star and Washington mines, as well as the ores from other properties now under development. Should the experiments on Lone Star and Washington ores prove successful, the capacity of the experimental unit will be increased to treat the ores on a commercial scale.

Northern Customs Concentrator, Cobalt, Ont., will build a new mill of a capacity of 250 tons per day, to replace the mill recently sold to the Cobalt Townsite company. The new concentrator will be built north of the La Rose Extension property, near Mile 104 on the Timiskaming & Northern Ontario Ry., and will cost approximately $110,000.

Goldfields, Ltd., Larder City, Ont., will probably build a cyanide annex to its mill next winter, the present state of the roads prohibiting transportation of heavy machinery.

Teziutlan Copper Co., Aire Libre, Puebla, Mexico, is building a 500-ton concentrator under the direction of Franz Cazin, chief engineer.

The Patagonia District, Arizona

By A. P. MacCallum*

The Patagonia district comprises within itself several "mining districts," as the term is used in making locations, etc., and consists of two separate ranges of mountains, the Patagonias and the Santa Ritas. These were formerly one range, but a great fault, which now forms the Sonoita valley, cuts the range in two. The entire district was buried under the great porphyry flows of the late Tertiary.

Mining operations were started at probably as early a date as anywhere in the state, the old Mowry mine having been worked for lead by the Confederates during the Civil War. It takes its name from Lieutenant Mowry, a Confederate officer who was in charge of the work.

Before 1873, before the demonetization of silver, the district was a scene of great activity, but afterward the majority of the mines had to close down as the fall in prices necessitated economy and closer extraction, which the experience and equipment of the time were incapabl of putting into practice. The ground-water level is not deep and fuel for power purposes was scarce, but with the present-day perfection of the internal-combustion engine, this source of trouble has been eliminated. Today the copper and silver deposits are receiving greater attention, but the district needs capital directed by men of experience and technical training.

*Mining engineer, Patagonia, Ariz.

DETAILS OF PRACTICAL MINING

Openpit Mining under Difficulties

Openpit, steam-shovel mining on the Mesabi range of Minnesota, is unquestionably the cheapest method and is adopted wherever it appears practicable ("Mining Methods on the Mesabi Range," a paper presented at the Minnesota meeting of the Lake Superior Mining Institute, August, 1913). Recent practice shows its availability for deposits that were formerly considered underground propositions, and some mines that were opened by underground methods have been changed to the openpit system, notwithstanding the fact that a considerable tonnage of ore had already been removed and that stripping and mining both presented conditions less favorable than before underground mining was undertaken. Among these is the Commodore mine, at Virginia. It consists of one 40-acre tract and is surrounded by the Lincoln, Union, Lone Jack and Missabe Mountain properties. A tonnage of 700,000 had been mined by underground methods, when it was decided to change to openpit mining. Adequate and suitable dumping grounds were difficult to obtain and to complete the stripping, necessitated dumping 800,000 yd. on the Commodore 40, over one-half of which composed the stripping area of the openpit. The waste dump finally reached a height of 87 ft. and the height from top of ore at the deepest stripping point to the top of the dump was 201 ft., showing that some of this stripping material was elevated in its transportation 201 ft., which was accomplished without going off the mine 40, except at the ends of two tail tracks where they ran over adjoining land. The tracks from shovel to dump consisted of four switch-backs on a 5% grade.

The equipment was standard-gage dump cars and Shay geared locomotives of 80 tons weight on the drivers. These locomotives are slower than the rod engines, but have more tractive power, particularly for starting their loads on heavy grades and curves. In mining at this property both the rod type and Shay locomotives are used and a comparison of the two types under similar conditions shows the rod engines more satisfactory on good tracks and low grades, but on grades over 3% and particularly where necessary to start the loads on heavy grade the geared locomotives have the advantage.

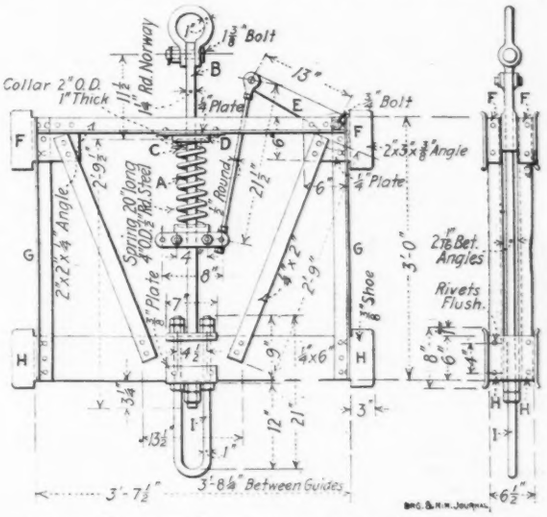
Limited area, depth and shape of ore deposit, yard facilities, etc., have made conditions at this property for steam-shovel mining more severe than at most openpits on the range. The approach is laid out on a 3% grade, which is equalized to allow for resistance on curves. During one season considerable loading was done on a 7% grade, the Shay locomotives being able to start and haul three loaded cars of 40 tons each, and the rod engines two. A few years ago it was the practice to lay out openpits with grades not over 2½%, and with curves not exceeding 20°. While it is desirable to keep within these limits of grades and curves, nearly every mine has found it possible and necessary to exceed practical railroad conditions.

The actual loading of the ore by steam shovels is practically the same all over the range. At some mines all the ore must be blasted in order to loosen it for better loading, while at other mines the shovels are able to handle the ore without any blasting. Rails of 60 to 80 lb. are used for mine tracks, the heavier steel being favored. The temporary loading tracks have to be changed for each succeeding shovel cut. At some mines, and especially where the loading tracks are straight and of the lighter rail section, it is the practice to jack up the track to be moved and then line or heave it over with bars. At other mines new track is laid behind the shovel and in place for the next cut, the previous track being taken up.

Light Safety Crosshead

By Roy Marcellus*

The drawing shows a light crosshead used extensively in the Cœur d'Alene district, Idaho. It conforms with the state laws regarding safety attachments for use in sinking. The spring *A* is compressed when the load



Steel Bucket-Crosshead with Safety Dogs

is freely suspended; when tension is removed, as by the ropes breaking, the spring extends and pulls the dogs *E* into the face of the guides.

The drawbar *B* has a collar *C* welded on it to rest against the spring cup *D*; this, with the nuts at the bottom, carries the load. The dogs are made entirely of steel and have teeth forged across their 2-in. faces. The upper shoes *F* are made of angle iron riveted to the vertical angles *G*, having clearance in the center for the operation of the dogs; the lower shoes *H* are made of plate, as usual. The bucket is attached by a chain to the U-bolt *I*. The crosshead can be built as light as 300 lb.

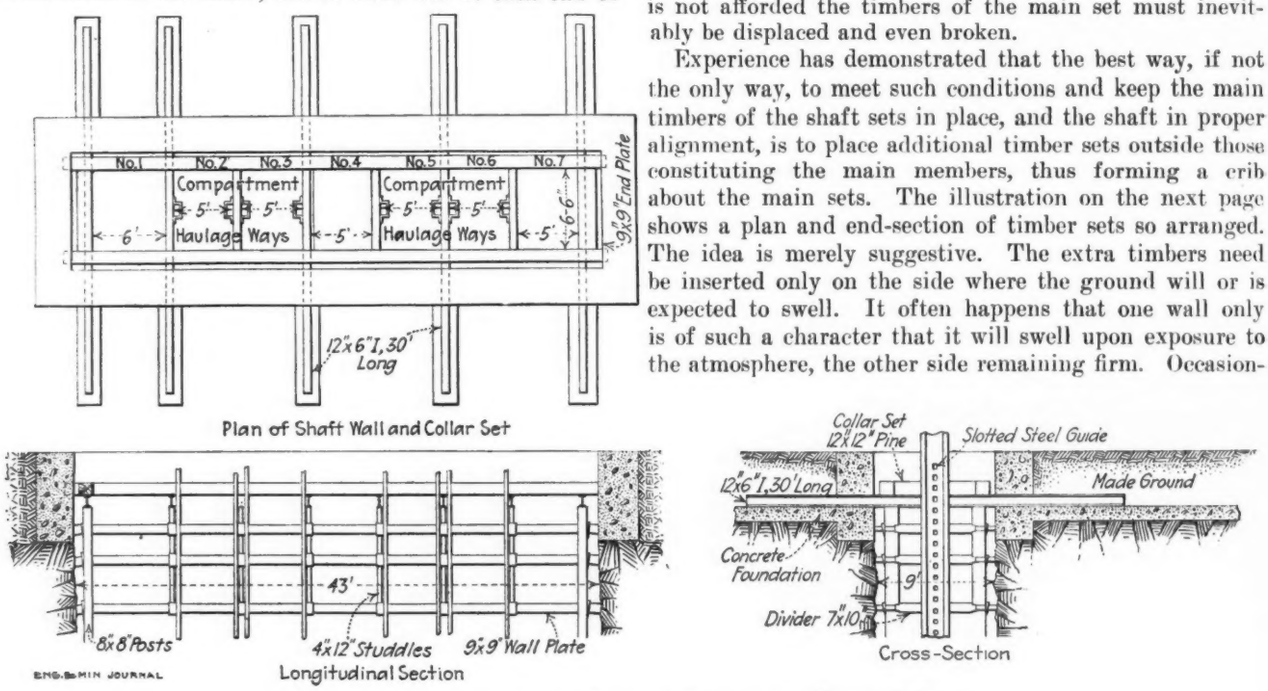
[It should be noted that the crosshead must ride with the bucket, since the rope does not pass through, as in

*Wallace, Idaho.

the ordinary type of wooden crosshead. This means that the bucket must be swung from a long chain when sinking, in order to extend to the shaft bottom when the crosshead is stopped at the end of the guides. A long connection such as this means considerable extra height in the headframe to permit dumping. A safety crosshead, which will operate similarly to the ordinary loose crosshead, is rather a complicated device mechanically.—EDITOR.]

I-Beam Supports for Collar Set

The illustration shows the method of supporting the collar sets employed for two shafts of the Brakpan mine on the Witwatersrand. The large rectangular shafts had seven compartments of the dimensions shown. Within 6 ft. of the surface, says Charles B. Brodigan (Sir Clement Le Neve Foster Memorial Lecture), a relatively hard rock was found, on which the shaft collar was supported. Five trenches were excavated at right angles to the long dimensions of the shaft; one of these was at each end of the shaft, and the other three were under the first, third and fifth dividers, as shown. This excavation was conducted in connection with that for the concrete wall, which inclosed the collar. Concrete was placed in both the trenches and the collar, and upon the concrete in the trenches were laid 6x12-in. by 30-ft. steel I-beams. These were filled around and partly covered with concrete, which was allowed to set thoroughly. The collar set of 12x12-in. timber was built up on this steel frame, being bolted to it. Since this was the reference set for the rest of the shaft plumbing, it was laid with care by the use of surveying instruments.



MANNER OF SUPPORTING COLLAR SETS WITH STEEL I-BEAMS

There Is a Three-fold Advantage in Electric Lights for Shaft Sinking. They give a superior light; they relieve the shaftsmen of the necessity of handling candlesticks and keeping their candles burning against the exhaust of the machines (A. I. M. E. "Bulletin," August, 1913); and when electric hoists are used, any failure of the power is at once indicated to the men in the shaft by the extinguishing of the lights. Their use in Butte is considered good practice.

Shaft Timbering in Swelling Ground

BY W. H. STORMS*

One method of timbering a shaft through swelling ground consists of using timbers of large dimensions, and reinforcing these when the ground is so heavy that it cannot be held back by one set. The Keystone shaft, at Amador City, on the Mother Lode, in California, is an example of this method. The first 400 ft. of that shaft is a solid crib of heavy timbers, as large as could be put in place, yet the timbering is unsatisfactory, and replacements have to be made every few months. Timbering of this character has almost universally failed to give satisfaction for the reason that the force of the slowly swelling ground is irresistible, and such ground cannot be held by solid timbers, no matter how arranged. The swelling ground must be cut away as it comes into the shaft. For the same reason close lagging is inadvisable, as the swelling ground will push the lagging inward causing it to bend and eventually to break, and if relief is not afforded the timbers of the main set must inevitably be displaced and even broken.

Experience has demonstrated that the best way, if not the only way, to meet such conditions and keep the main timbers of the shaft sets in place, and the shaft in proper alignment, is to place additional timber sets outside those constituting the main members, thus forming a crib about the main sets. The illustration on the next page shows a plan and end-section of timber sets so arranged. The idea is merely suggestive. The extra timbers need be inserted only on the side where the ground will or is expected to swell. It often happens that one wall only is of such a character that it will swell upon exposure to the atmosphere, the other side remaining firm. Occasionally, not only the walls, but the material filling the fissure, as well, swells, though the ore itself seldom swells, and for this reason the extra timbers may not be required at the ends adjoining the ore. Where the pay streak is small, however, and the walls swell, then it may be advisable to place the extra timbers at the ends, as well as against the walls of the shaft. The illustration shows one end timbered to resist swelling ground, the other end being without the additional timbers.

Where this method of timbering is introduced, the shaft must be cut much larger than would otherwise be necessary, and this, together with the extra timber and labor required, adds to the first cost of the shaft.

Economy will develop later, when the swelling ground begins to exert its influence on the sets. When this occurs the ground, being accessible, can easily be relieved, the

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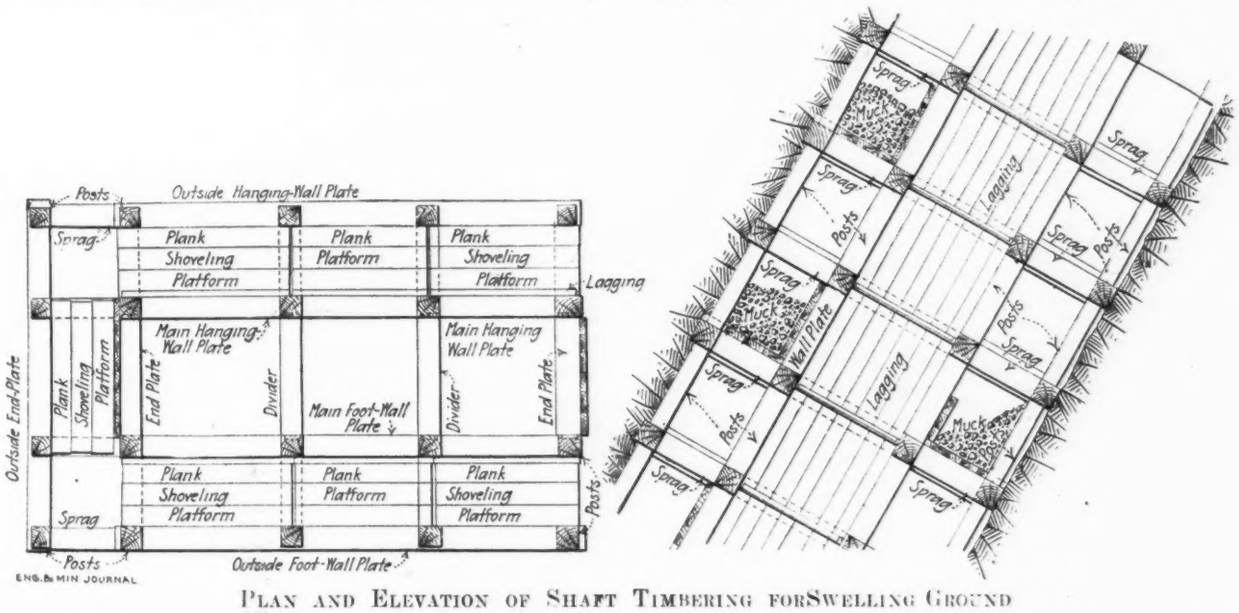
shaft be kept in alignment, and much expense be saved. In the vertical section the general relation of the main shaft sets to the outside extra timbers is shown. An important feature of this method is that shoveling platforms are placed at intervals on the sprags, which separate the main wall plates from the outside plates. The distance between these shoveling platforms will be determined largely by the angle of inclination at which the shaft is sunk. A shaft sunk at a high angle permits a greater distance between these floors than where the angle is comparatively flat.

It is obvious that any rock dropping from the hanging wall must not be permitted to fall into the main compartments of the shaft, therefore, the side lagging is placed horizontally, contrary to the usual custom, although the end lagging is placed vertically as usual. The shoveling platforms on the foot-wall side of the shaft need not be placed at frequent intervals, as there will be comparatively little danger of rock falling down the shaft from that side, unless the shaft be quite steep and the shoveling platforms are allowed to become full. In this case any rock becoming loosened from the foot wall might slide over the pile of muck lying on the platform next below it and go bounding down the shaft.

The illustration shows the outside plates lying solidly against the rock. In some cases it may be desirable to place blocking back of these timbers. When this is advisable, suitable blocks may be built up from pieces of 2x12-in. plank to the desired thickness. This will afford a better opportunity to keep the shaft alignment. Such blocks would be placed at the corners and opposite the dividers of the main sets. The posts of the outside plates may be held in place by the use of temporary sprags, consisting of pieces of 2-in. plank of suitable width, which shall reach from the outside post to that opposite it in the main set. These planks are shown in the vertical section. It cannot be hoped that this expedient will dispense with the employment of men in the shaft, for it does not, but it gives the repair gang a chance to get at the main cause of the trouble and at the same time permits hoisting in the main compartments of the shaft to continue practically without interruption.



PLAN AND ELEVATION OF SHAFT TIMBERING FOR SWELLING GROUND

Safety Rules—Open Pits and Abandoned Openings*

(1) Gopher holes should be of such size that it will not be possible for a man to enter them except where the material is of such a nature that a small hole cannot be dug.

(2) Before exploding a blast, care should be taken to warn men working underground in dangerous proximity to where the blasting is to be done.

(3) In using the wrecker on stripping or lean-ore dumps, foremen and wrecker engineers should see that the track is lined back from the edge of the dump far enough to be perfectly safe, and in every case, before taking a lift, the machine should be securely blocked or clamped to rails underneath.

(4) Be careful not to roll down chunks on men at work below you and keep the banks picked down so that they will not cave in on you.

(5) Special men in charge of competent foremen should be employed in each open pit to keep the banks picked down.

(6) Employment of regular track cleaners should be confined to day shift, and they should be instructed to face the danger of approaching trains when at work.

(7) All parts of operating open pits or quarries where there is a steep bank higher than 6 ft. should be guarded by a suitable fence.

(8) All steep footpaths leading into an open pit or quarry should be provided with suitable handrails.

(9) Walks or thoroughfares in regular use leading into an open pit or quarry should be kept free from obstructions which would make their passage dangerous, especially if not well lighted.

(10) When excavation is being done it should be protected by barriers and at night by lights.

(11) All excavations liable to cave in should be shored up.

(12) All shafts, open pits, caves and abandoned work-

*From Inland Steel Co.'s book of rules.

ings should be carefully fenced or otherwise protected.

(13) Abandoned shafts and test pits should be blasted in; or if necessary to leave an opening for air, a covering of rail should be secured over the opening and a fence provided.

Blasting Operations

(14) Shelter houses constructed of steel frame and lined with ties, or circular houses built entirely of steel, should be used in each open pit at a convenient and reasonable distance from where the blasting is taking place.

(15) Bulldozing should be eliminated and block holes used wherever possible.

(16) When bulldozing is to be done directly in front of a shovel, no one should remain on or under the shovel for protection.

(17) Black-powder cans should not be rolled down the bank.

(18) Black-powder cans should not be opened near a light or fire.

(19) Black powder should be removed from the bung-hole only, and care should be exercised in removing the seal. The can should not be cut open or torn in any manner.

(20) In charging vertical holes with black powder, an approved shield, with funnel and spout parts made of copper, should be used at all mines.

(21) In loading gopher holes some method that makes it impossible to leave a train of powder throughout the hole should be used.

(22) In firing black powder duplicate means of firing should be used, one of which should be electric.

(23) The foreman should see that every one is in the shelter house before allowing shots to be fired.

(24) Drilling concerns operating on the property of the company should comply with these rules and regulations.

❋

Disadvantage of Sprays in Drilling

The existing Queensland laws in general require the use of water for the prevention of dust in underground drilling. It is stated, however, in the annual report for 1912 of the Under-Secretary for Mines that the rule is so framed as to permit variations to some extent, at the discretion of the inspector. The necessity of this provision became apparent in several of the deep mines during the last year. It was found that the increased humidity produced uncomfortable conditions and even in some cases increased the danger of accidents. For instance, the excessive use of water at the drills caused the filling in one of the Mount Morgan stopes to become saturated with water and this was shown by inquiry to have been the chief cause of an extensive collapse of timber.

❋

An Exhaust Into the Water Column for Sinking Pumps is usually provided in Butte shaft-sinking operations (A. I. M. E. Bulletin, August, 1913). An example of this method of exhaust on a station pump was mentioned in the "Journal," Aug. 16, 1913. Pumps run in this way are noiseless and will not freeze in a cold shaft. The column is not under so heavy a pressure, being thus less liable to breakage, and less trouble is had with the pump packing. A drain cock must be provided, so that the exhaust will not have to start against a full column of water, and an arrangement to provide for atmospheric exhaust when desirable should also be included, as well as a check valve to keep the water from running back into the cylinder of the pump when the latter is shut down.

Automatic Link Car Coupler

The coupling device illustrated, is one described by J. E. Jones in *Coal Age*, July 26, 1913. It consists of six parts: the head *A*, the hook *B*, the dog or latch *C*, and the three links *D, E, F*. In Fig. 1 the device is shown ready for coupling. In Fig. 2 the hook has struck the bottom of the dog so that the large link *F* has been thrown on the hook. In Fig. 3 the cars have separated enough to bring the links taut and settle *F* in its proper position in the hook. The link *D* is slipped into its place from the side and is not removed until broken or worn; the link *E* is made small, serving only to bring *F* into the proper plane: the link *F* has an inside diameter of about 6 inches.

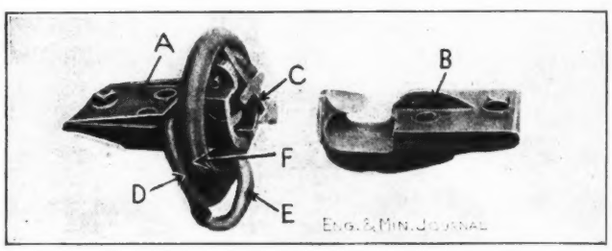


Fig. 1. Coupler Set for Automatic Attachment

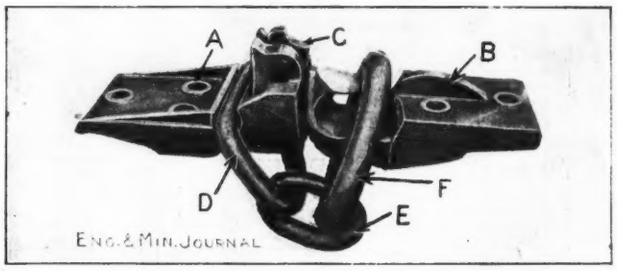


Fig. 2. Coupling Ring Fallen into Position

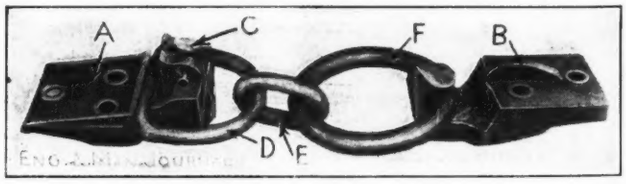


Fig. 3. Coupler Drawn Tight

All the links are of high-grade iron or steel. The head and hook are malleable castings, bolted to the draw-bars of the cars, and the dog is also a malleable casting designed with a notch on the top to carry the link *F*. Its lower striking surface is increased by the four side projections.

The object of an automatic coupler is chiefly to reduce the number of accidents from men being caught between cars and also to some extent to save time. One objection to the one here described is that it is not symmetrical, necessitating that the proper ends of the cars be brought together for coupling; this might often be a cause of delay and annoyance. A further objection is that the link is not always in position for coupling, but must be set by hand. The device, however, gives sufficient play between the cars to allow easy starting to compensate for this.

DETAILS OF METALLURGICAL PRACTICE

Launder Data of the Washoe Concentrator

In the accompanying table is given information concerning the launder system installed in the concentrator of the Anaconda Copper Mining Co., at Anaconda, Mont. The grades shown are not necessarily the minimum at which the given pulps will flow, but are all safe slopes. Where extra headroom was available, it was utilized in steeper launders. There are a great many factors which effect the flow of pulp in launders which must be taken into consideration in laying out a launder system. The more important of these factors are: The sizes and specific gravities of the grains of solid matter to be transported, the shape of the grains, the sharpness of the fractures, the density of the pulp, the depth of the stream, the presence or absence of slime and the character of the launder material in contact with the pulp. All of the launders in the Anaconda mill are constructed of wood and are rectangular in cross-section.

The gangue material in the ore treated at Anaconda is quartz and highly altered granite. The principal minerals are chalcocite, enargite and pyrite.

LAUNDER DATA OF THE WASHOE CONCENTRATOR, ANACONDA COPPER MINING CO.

Material Handled	Size of Launder Inches Depth	Width	Grade, Ins. per Ft.	Lining	Ratio Solids to Water	Diameter Largest Particle mm.	Depth of Stream in Launder, In.	% of Solids on 60 Mesh	Remarks
Undersize ¼-in. round-hole trommels	15	10	2.0	Cast iron	1 : 3.5	21.0	1.25	82.0	Contains slime
Undersize 5 mm. round-hole trommels	7	8½	3.0	Cast iron	1 : 5.2	5.0	1.25	75.0	Contains slime
Undersize 4 mm. round-hole trommels	9¼	10½	1.75	Cast iron	1 : 5.0	4.0	1.50	50.0	Contains slime
Undersize 2½ mm. round-hole trommels	7	8½	2.5	Cast iron	1 : 8.2	2.5	0.50	62.0	Contains slime
Hutch product of harz jigs	7	6½	1.0	Cast iron	1 : 22.7	6.0	1.00	95.0	No slime
Feed to Huntington mill	7	6	1.9	Cast iron	1 : 3.6	2.0	1.25	81.0	No slime
¼-in. concentrate	10	9	1.3	Cast iron	1 : 12.8	7.0	1.00	100.0	No slime
Evans jig concentrate	9½	9½	1.2	Cast iron	1 : 27.8	2.0	1.50	72.5	No slime
Coarse table feed	7½	7	1.2	No lining	1 : 14.2	0.3	0.50	7.0	Contains slime
Fine table feed	5½	4½	1.2	No lining	1 : 13.0	0.2	0.75	0.0	Contains slime
Table concentrate	11	8¼	0.75	No lining	1 : 15.6	0.2	0.75	0.0	No slime
Table middling	4½	5	0.75	No lining	1 : 15.6	0.2	0.75	0.0	No slime
Table tailing	7	7½	0.75	No lining	1 : 10.0	0.3	0.50	10.0	A little slime
Secondary table feed, remodeled section	7	7½	1.20	No lining	1 : 7.4	0.9	0.50	44.0	No slime
Fine primary table feed, remodeled section	7	7½	1.20	No lining	1 : 14.0	0.35	0.50	2.0	No slime
Coarse primary table feed, remodeled section	7	7½	1.20	No lining	1 : 4.4	0.9	0.50	46.5	No slime

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Safety Rules—Engine Rooms*

(1) Keep out of engine rooms and power houses unless your duties take you there.

(2) Do not place any material, tools, etc., on platforms or stairs where they will fall off and injure someone below.

(3) When shutting down an engine use the safety switch or safety valve.

(4) Under no circumstances should circuit breakers, governors, engine stops or other safety devices be blocked or otherwise made ineffective. If such apparatus gets out of order report it to your foreman at once.

(5) Engines should be blocked so that no parts can move wherever men are working on flywheels, commutators or any part where there is danger of accident in case the engine should turn over or move. This is best accomplished by putting blocks between the crossheads and the ends of the slide.

(6) Power-engine revolutions should be taken every day in order to make sure the engine is not running over the speed limit.

(7) Keep away from in front of cylinder heads of engines.

(8) Do not fool with compressed air. Never blow it on anyone. It may enter his body and injure or kill him.

(9) Floors should be kept free from oil and grease to prevent slipping and falling against moving parts of machinery.

(10) Stairs and platforms of engines should have a rough or checkered surface.

(11) Flywheels should be guarded. This guard may consist of railing, wire net or metal casing. If located within 18 in. of the wheel it should be at least 3½ ft. high; wheels not over 5 ft. high should be encased whenever practicable. Railing guards should be provided with toe boards.

(12) Tail rods should be fenced or encased.

(13) Governor balls should be guarded whenever they are so placed as to be dangerous.

(14) Covering should be provided on all steam lines, wherever practicable, when pipes are so placed that persons are liable to be burned by coming in contact with them.

(15) Exhaust pipes from machinery should be run outside of the building and extended above the roof eave.

(16) Exhaust from temporary machinery should be run up so high that steam will not obscure the vision of workmen in the vicinity.

(17) All exhaust pipes should be provided with drains.

(18) Drains or exhaust pipes from heaters should be run outside of buildings to sewers or pits.

(19) Where exhaust pipes or drains lead into a pit it should be provided with a metal cover.

(20) Where valves are located more than 6 ft. above the floor, and it is necessary to use them frequently, platform, stairs, or stationary steel ladder shall provide means of access thereto.

(21) To prevent valve wheels from slipping off valve stems a locknut or cotter pin should be provided at the stem end.

(22) A locking device should be provided on levers and chains operating steam valves.

*From Inland Steel Co.'s book of rules.

Electrodeposition of Zinc

An invention relating to improvements in zinc refining has been patented by U. C. Tainton and J. N. Pring, of Manchester, England, under U. S. patent No. 1,059,233. According to this invention a process for the electrolytic deposition of metallic zinc from its salts consists of adding to the solution of the salt a large proportion of acid, as, for example, 10 to 30% and a small proportion of an "addition agent," preferably a colloid such as gum tragacanth, and electrolyzing the solution with current of high density. A saturated solution of zinc sulphate with sulphuric acid is used. The addition agent or colloid, must fulfill the following conditions: First, it must be soluble in the electrolyte, that is, it must not be precipitated by the zinc salt or by the acid; and, second, that it must increase the overvoltage or electrical potential necessary for the separation of hydrogen, thus giving preference to the electrolytic deposition of the zinc.

The process may be used for extracting zinc from its ores by forming a solution of a salt of zinc, as, for example, zinc sulphate, and adding a large proportion of acid and a small proportion of the addition or colloid agent to the solution and electrolyzing for the deposition of the metal, with a current of high density.

In the practice of this system, a solution for depositing zinc consists of zinc sulphate dissolved in water to which is added 10 to 11% by weight of sulphuric acid, sufficient zinc sulphate being used to give the acid solution a specific gravity of 1.38 to 1.4. About 0.1 to 1% of gum tragacanth is added. A solution of the gum is prepared by first adding alcohol to form a paste and then water. The addition of alcohol prevents the gum forming into lumps when water is added.

If it is required to deposit the zinc on a metal article, the article is placed in the solution as cathode, the anode being formed of either zinc or a substance which does not go into solution, for example, lead peroxide or manganese dioxide.

Current may be used at a higher density than is usually employed in electrolytic deposition of zinc, 500 amp. per sq.ft. of cathode being a suitable density. A density of one-fifth of this amount may be used with success, but by using high density a great amount of time is saved.

The novel features of the process are first, the high current density that is employed and consequent saving of time, and, second, the deposits obtained are of especially fine quality, smooth and lustrous. A third advantage is that commercial materials may be used in preparing solutions, as it is found that most impurities have no effect in the presence of the colloid and a large quantity of acid. The solution does not require so much attention as has usually been required, as it is not necessary to regenerate it frequently, owing to the wide limits of concentration between which the deposition is successful. The process is well adapted for plating of aluminum which has usually been found difficult. In the case of zinc refining, the electrolyte may be used without moving or rotating the cathode or agitating the solution. Owing to the high concentration of the acid and the wide limits between which the concentrations may be varied, it is especially easy to make up solutions, zinc and zinc oxide being readily soluble.

The invention is found useful for galvanizing wire electrically, a process which has hitherto been impossible, owing to the low current densities which it has been necessary to use. While primarily designed for zinc deposition on metal surfaces, the electrolyte may be employed in accumulators and for secondary batteries in which a zinc cathode is used.

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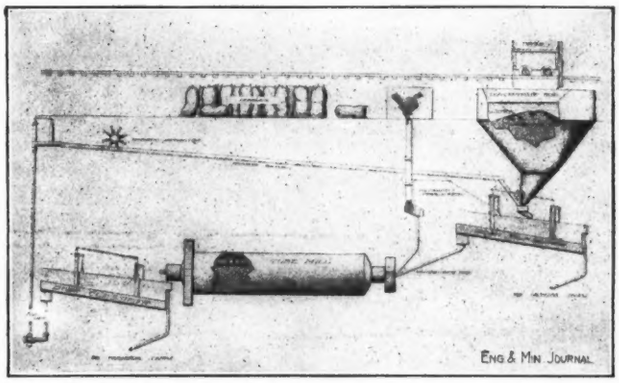
Tube-Mill Circuit at the Alaska Treadwell Mill

Concentrate is cyanided at the mill of the Alaska Treadwell Gold Mining Co., at Douglas Island, Alaska. The material is brought to the plant in cars running by gravity into revolving tipples which invert them and drop the contents into round, conical-bottom steel bins. The bins are 15 ft. in diameter and the bottoms have a 55° angle. The concentrate is sampled while in the car, using a long ship-auger. Unslaked lime is added to each of the cars after leaving the tipple, forming a bed for the concentrate and also aiding in discharge of the material. The concentrate in the bin is kept covered with water which prevents its oxidation.



OUTLINE OF TUBE MILL CIRCUIT AT ALASKA TREADWELL MILL

Tightly fitting gates control the bottom of the bin, the contents of which are sluiced directly into a Dorr classifier, the sluicing medium being the oversize return. The classifier makes 24 strokes per minute. Slime from the classifier is led to the Pachuca tanks for treatment and the coarse material is delivered into a 5-x22-ft. Abbé-type tube mill which is equipped with a spiral feeder. Corrugated sectional lining is used in the tube, which makes 27 r.p.m. The finely ground product from the tube mill is delivered into another Dorr classifier from which the slime is taken to treatment in the Pachuca tanks and the sand delivered into the foot of an air lift. The sand is lifted to a point high enough to enable it to flow back to the first classifier by gravity, and is delivered into an open launder.

Accumulated iron is removed from the coarse pulp passing through the launder by means of a magnetic device which has already been described[1]. The return of this coarse oversize is used to sluice the concentrate from the bin into the initial classifier.

Pebbles are automatically fed into the spiral feeder through a pipe leading from the pebble bin. The pebbles are fed, a few at a time, into the feeder and are controlled by the movement of the first Dorr classifier. The whole circuit is illustrated above.

[1] "Eng. and Min. Journ.," Sept. 6, 1913.

THE ASSAYER AND CHEMIST

Magnesite Crucibles

By Donald M. Liddell*

The need for a crucible which shall be more inert to its charge than either fireclay or silica, and without reducing action, such as the graphite has, is probably one which sooner or later arises in every assay office. Theoretically the need is met by magnesite, and the following is merely a brief account of the search for data on this subject.

Crucibles made according to a description in the *Wisconsin Engineer,* November, 1912, were satisfactory for work in the electric furnace of the resistance type. The directions are, to moisten the calcined magnesia with water, and tamp it around a wooden core set in a crucible turned from a bar of Acheson graphite. The core is withdrawn and the crucible set in an oven heated by gas, until thoroughly dry. It is then covered with a thin graphite cap, buried in a granular carbon resistor, and heated to a temperature a little above that required in the worked proposed. After so baking, the magnesia linings are readily removed from the crucibles. For use, they are replaced in the graphite crucibles, charged as desired, covered with a magnesia disk, and are then ready for the furnace.

Commercial calcined magnesite was found by O. P. Watts, author of the paper referred to, to vary greatly in the amount of iron oxide contained.[1] This is detrimental, because in baking the linings, it distills out, is reduced to iron in contact with the inner wall of the crucibles, and this iron is then likely to corrode both the crucible and the lining by carrying carbon from one to the other.[2] Any considerable amount of carbon dioxide indicates insufficient calcining, and such material will show excessive shrinkage in baking.[3] If the shrinkage is excessive, the magnesite may be fused before using in the electric arc. This calcined magnesite will probably not shrink enough, so a little (2 to 10%) raw material may be mixed with it to give it suitable working qualities.

The extreme temperature at which such magnesia linings may be used in graphite crucibles in a resistance furnace is fixed, not by the fusing point of magnesia, but its decomposition by the graphite. On account of this action, the granular resistor should never be allowed to come in contact with the magnesia linings.

I have been informed that magnesite apparatus is made to order by the Royal Berlin Porcelain Co., and that it can be obtained through the Wilson-Maeulen company, of New York (presumably from other agents for the Royal Berlin crucibles, etc., also). I have not used any personally, but am told it is entirely satisfactory, except for the time consumed in getting it. The magnesite crucibles are said to be rather more porous than are the fire-clay crucibles, resembling in texture the sand crucibles. This is hearsay only, however.

For muffle use, where a basic crucible is required for a basic charge, I have made satisfactory crucibles by machining magnesite bricks. These work well under drill press or on the lathe, although the material must be handled far more tenderly than iron or steel, so use slow speeds and light cuts. These machined crucibles must be set down in a clay or silica crucible and protected by magnesite powder or some similar material, so as to take the strain of the tongs off the magnesite. Wet charges cannot be used in them except with the utmost care in heating. It is better to avoid them altogether. Chrome brick, the alternative to magnesite, which naturally comes to mind, is not a feasible proposition, because of the hardness of the material, which immediately puts the tools out of business.

*Associate editor, "Engineering and Mining Journal."

[1]Analyses of commercial magnesite clay and magnesite bricks are:

	MgO	SiO_2	Fe_2O_3	Al_2O_3	CaO
Clay	82.96	1.18	8.18	1.20	2.89
Clay *	75.10	8.44	5.17	0.14	6.23
Brick	86.54	1.08	8.00	0.26	4.10
Brick	91.71	1.29	4.95	1.63	tr.

*Very poor quality.

[2]"Trans.," Am. Electrochem. Soc., Vol. 11, p. 279.

[3]Watts gives the average shrinkage as 12% along the diameter, and 17% along the length, for the temperatures with which he worked. The linear expansion of dead-burned clay is given by other experimenters as about 0.000008 per degree Fahrenheit, which is a wide range.

Determination of Lithium

As a result of an investigation of various methods which have been proposed for the determination of lithium in mineral waters, that recommended by Gooch, modified slightly in some of the details of manipulation, was found by the Bureau of Chemistry, U. S. Department of Agriculture, to be satisfactory when weighable amounts of the metal are present, according to an abstract in *Journ. Soc. Chem. Ind.,* Feb. 28, 1913. The method is carried out as follows: The water is acidified with hydrochloric acid, barium chloride is added, and the whole is evaporated to dryness; the residue is dissolved in a small quantity of water and hydrochloric acid, the barium sulphate is removed by filtration, and the filtrate is evaporated. After ignition to remove ammonium salts, the residue is dissolved in water, the magnesium salts are precipitated by the addition of milk of lime (a double precipitation is necessary if the water contains a large quantity of alkalis), and the excess of calcium hydroxide, together with barium salts, is removed by treatment with ammonium carbonate in ammoniacal solution. The filtrate from the calcium precipitate is evaporated, the residue is ignited, and any remaining traces of calcium salts are removed as oxalate.

The solution is then evaporated in a weighed platinum basin, the residue is treated with a small quantity of hydrochloric acid, again evaporated to dryness, ignited, and weighed. The mixed chlorides thus obtained are dissolved in a few c.c. of water and the solution is transferred to a flask (any insoluble matter is filtered off, ignited, and its weight deducted from that of the mixed chlorides); the solution is now boiled until the salts begin to crystallize out, and about 40 c.c. of amyl alcohol are added. The contents of the flask are next distilled

until a thermometer in the neck of the flask indicates 130—132° C. (the boiling point of amyl alcohol), a drop or two of dilute hydrochloric acid being then added and the distillation continued until the boiling point of amyl alcohol is again reached. The mixture is cooled slightly and filtered, note being made of the volume of the filtrate, and, after the insoluble portion has been washed with a little anhydrous amyl alcohol, the filtrate is evaporated to dryness.

The residue, consisting of lithium chloride with small amounts of potassium and sodium chlorides, is treated with sulphuric acid, ignited and weighed. The sulphates are then dissolved in water and treated with ammonium phosphate and ammonia; if any precipitate forms within about 15 hours, it is collected and weighed as magnesium pyrophosphate, an equivalent weight of magnesium sulphate being subtracted from the weight of the mixed sulphates. To correct for the solubility of potassium and sodium chlorides in amyl alcohol, there must be subtracted from the weight of the sulphates, 0.00109 gram for every 10 c.c. of the amyl alcohol filtrate (exclusive of the amount used for washing). In many cases the corrections amount to the total weight obtained within the limit of the weighing error of the work, and the amount of lithium present may then be determined by means of the spectroscope. For this purpose the residue of sulphates is dissolved in water and and spectroscopic observations are made, until, with increasing dilution of the solution, the lithium line is no longer visible. Knowing the extent of the dilution, the amount of lithium is ascertained by comparative observations with solutions containing known quantities of lithium under the same conditions as to dilution, etc. The limit of visibility of the red line of the lithium spectrum is reached with 0.00002 mg. of lithium per c.c. of solution.

A preliminary and approximate spectroscopic determination of lithium in the mixed chlorides obtained in water analysis saves much time by indicating whether it is worth while to extract the lithium for weighing. A similar test may be used to determine whether much strontium is present in the calcium precipitate obtained in the usual way.

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Determination of Nitrates by Ferrous Sulphate

The best method for the determination of nitrates in natural deposits of Chile saltpeter constitutes a problem of great interest to those working deposits of the kind. There are in existence a great number of methods, but the one here given is probably best adapted for field work, as it does not require large quantities of reagents nor clumsy, fragile apparatus. It is one of the number described by Guillermo Garcia Latorre, published in the Chilean *Boletin de la Sociedad Nacional de Mineria,* for March and April, 1913.

The method is based on a qualitative reaction of nitrates and consists of adding ferrous sulphate to the solution in which the presence of nitrate is suspected, in the presence of sulphuric acid. The method is not extremely accurate, but has been widely adopted on account of its simplicity and rapidity. The ferrous sulphate is oxidized by the nitric acid liberated by sulphuric acid in solution and is transformed into ferric sulphate. The nitric acid, having been reduced to nitric oxide, dissolves in ferrous sulphate. When all the nitric acid has been reduced by ferrous sulphate, remaining quantities of the latter dissolve the nitric oxide formed, which gives a solution of dark brownish-gray color. This color increases in intensity until all the gas is dissolved. The end of the reaction is noted by the cessation of change in color of the solution. The test is best made at a temperature of 60° to 80° C.

The equation is as follows:

$$6\,FeSO_4 + 2\,HNO_3 + 3\,H_2SO_4 = 3\,Fe_2(SO_4)_3 + NO + 4\,H_2O$$

The nitric oxide is oxidized by the action of air into nitric and nitrous acids, according to the following reactions:

$$2\,NO + O + H_2O = 2\,HNO_2$$
$$2\,NO + 2\,O + H_2O = HNO_2 + HNO_3$$
$$2\,NO + 3\,O + H_2O = 2\,HNO_3$$

These acids act upon new quantities of ferrous sulphate as follows:

$$2\,FeSO_4 + 2\,HNO_2 + H_2SO_4 = Fe_2(SO_4)_3 + 2\,NO + 2\,H_2O$$

so that the longer the time occupied in the analysis the greater are the qualities of nitric and nitrous acids formed and consequently the greater the quantity of ferrous sulphate used, making it appear that there is a larger quantity of nitrate present than is actually the case. This is the principal cause of error in this analysis and may be avoided, in a measure, by exceedingly rapid work. There are also other factors which influence the accuracy of the method, such as temperature, dilution, etc.

Standard solution of ferrous sulphate must be prepared previous to the analysis. To standardize this, dissolve 10 grams c.p. nitrate of sodium in a liter of water; take 25 c.c. of this solution and add 10 c.c. of sulphuric acid to it. Heat to 70° C., and add the ferrous-sulphate solution, drop by drop from a burette, continuously stirring the liquid. When the gray color remains constant the titration is complete, but the standardization should be made three or four times and the average of titrations used as the standard. The titer is expressed in milligrams of sodium nitrate and is obtained by dividing the quantity of nitrate contained in the 25 c.c. used by the number of cubic centimeters of ferrous sulphate solution added from the burette. The analysis is performed in exactly the same way. The method is accurate to 3 or 4 per cent.

⁂

Estimation of Zinc as Phosphate

The phosphate method for the estimation of zinc has been investigated in order to find the reason for occasional unsatisfactory results. by T. M. Findley and A. C. Cumming ("Chem. Soc. Proc.," p. 153, 1913). It was found that the results were inaccurate (1) if the solution contained more than a trace of acetic acid; (2) if the solution, after precipitation, was alkaline; or (3) if the solution contained sodium or potassium salts. The method can be modified to give correct results in the presence of sodium and potassium.

Some Close Work in Iron Mining

SYNOPSIS—High concentrating ratio in Alabama brown ores. Extensive brown-ore reserves of the United States. Low costs and interesting installations in Birmingham Clinton ore mines. Alabama Clinton reserves must be considered as more extensive than heretofore. Changed conditions in Maryland smelting and in New York Clinton ores. New York magnetites are concentrated to a bessemer grade.

It is well not to forget that there are in the United States other places than the Mesabi range where iron is mined, and where records are made. I should like to call attention to a few items from my notebooks, gathered recently in work for the government, as consulting engineer of the Bureau of Mines.

Alabama Brown-Ore Costs

I found in the brown-ore regions of Alabama that they are mining an average of 7 or 8 cu.yd. of material for every ton of 50 to 52% ore, dry analysis, that they save. The Weems mine, of brown ore, in the Rock Run district, has mined 2,200,000 yd., and has secured 300,000 tons of ore; one ton to every 7 cu.yd., plus. A company in that vicinity was mining, at the time of my visit, 15 yd. to get 1 ton. All this material has to be mined from the ore bank, transported to the washery, washed and loaded on cars, and the cost figure for this operation of 15 yd. to the ton was about $1. Companies like the Republic Iron & Steel Co. are buying brown ore of a guarantee of 45%, dry, at $1.35 per ton, f.o.b. cars. The Roane Iron Co., of Chattanooga, contracts for brown ore at $1 per ton when No. 2 foundry iron is selling at Birmingham at $7, and a 5c. premium for every dollar added to the price of pig iron until it has reached a maximum cost of $1.50. That would make the Roane company's brown ore cost it, now, about $1.20. This is for a ton of 2268 lb., which is a weight used, I believe, nowhere else. The Woodward Iron Co. figures its brown-ore costs at about $0.821, at the mine.

Brown-Ore Reserves

The distribution of brown-ore banks, throughout the United States, is far wider than that of any other type of iron-bearing material. These banks occur in the States of Vermont, Massachusetts, Connecticut, New York, Pennsylvania, Maryland, Georgia, Tennessee, Alabama, Kentucky, Missouri, Texas, Iowa and Wisconsin. They are mined in Pennsylvania, Virginia, Tennessee, Georgia, Alabama, Texas, Iowa and Missouri; chiefly in Alabama and Georgia. That they are a factor to be reckoned with in the future, may be gathered when I say that there are areas of these banks in Alabama alone, covering 7000 square miles. No estimates of tonnages that are worthy of credence have ever been made, and it is impossible to make such estimates, on account of the uncertainty of the deposits. It is a common saying in the South that no man can see into a brown-ore bank farther than the end of his pick. But it is not unlikely that the deposits of these ores in the Southern states of Virginia, Tennessee, Georgia and Alabama, will be found ultimately to be of enormous extent.

Alabama Clinton Ore Costs

In the Clinton ore mines of Birmingham some of the mining companies pay their miners on the basis of 30c. per ton for ore. This means breaking, loading in tramcars, and the delivery of the cars to the main heading, where they are picked up by the company and pulled to the tipple at the surface. In these cases, the company furnishes drills, air and steel; the contractor, usually a negro, supplies labor and powder. Some companies pay less than 30c. per ton. The pig-iron costs of one of the large mining and iron-making companies of the district, with the elimination of all intermediate profits, and by the use of byproduct coke, have been under $6.50 per ton, and can now be figured at about $7. Possibly there are others that cannot do so well.

In the case of one of the operating companies of the district, the assemblage of materials is on the following basis: It owns a strip of land 4 miles long and about a mile wide; at one end of this strip are its ore mines, as good as can be found on Red Mountain; at the other end are its coal entries; in the center are its furnaces; connecting all is a standard-gage railway laid with 100-lb. steel, and using cars of 140,000-lb. capacity. This road connects at points less than a mile from the furnaces, with 10 trunk lines of railway. Another operating company starts the incline track carrying ore to its furnace mouths in a limestone quarry, suitable for flux. The advantage of this condition is neutralized, however, by the fact that none of these companies uses any flux to speak of. Another company has five great blast furnaces in a row, some of them of 500 tons per day capacity. I think it is a fact that nowhere in the world outside of Birmingham can five great blast furnaces be found under single ownership and in one line.

An underground mine in Etowah County, Alabama, on the Clinton formation, is successfully producing a 45% ore from a seam that averaged, at the time of my visit, 25.5 in. thick. Ore is successfully mined in this property to a thinness of 14 in. Miners get 55c. per ton for ore in faces 36 in. thick, with a premium on thinner seams and a penalty on thicker. At this mine the ore is trammed underground in main galleries 48 in. high by "jennies," whose ears seem to have been cropped to fit the openings, is hoisted up an incline on platforms to the main tunnel level, is trammed out to the surface by mules and is run through a crusher and over a picking belt to remove slate; the picked ore is then let down a long incline to the railroad track. The cost of all these operations was averaging, at the time I saw the mine, about $1.40 per ton of picked ore, this figure including all overhead costs, as well as transportation to the furnace and amortization.

Alabama Clinton Reserves

Generally accepted figures on the tonnage of Clinton ores available in that part of Alabama between Birmingham and the suburb of Bessemer, have been for about 800,000,000 tons of the better grade, or "self-fluxing" ore. But by virtue of a drill hole, sunk last year by Cole

Note—Reprinted from a paper entitled, "What Our Neighbors Can Do in Mining Iron Ore," prepared by Dwight E. Woodbridge, consulting engineer, Duluth, Minn., for the Minnesota meeting of the Lake Superior Mining Institute, Aug. 26, 1913.

& McDonald, of Duluth, this figure should be doubled, as to probable ore. This drill hole went vertically 1902 ft. to the top of the "big seam" of Clinton ore, that outcrops 14,500 ft. away. At the outcrop of the "big seam" it shows a thickness of some 12 ft., but at this point, some 3 miles back from the outcrop and 1900 ft. deep, the ore shows a combined thickness of 15 ft. in two seams parted by 2 ft. of slate. It is probable that there is as much good ore between Birmingham and Bessemer, an extreme length of about 20 miles, as there is on the Mesabi range, and that there is about as much merchantable ore of the Clinton hematites in Alabama as of all merchantable ores in the Lake Superior region. And lest we forget the comparative value of these ores, let us bear in mind that a 40% hard Clinton hematite of Alabama is as good for furnace use as a 50% Mesabi hematite, on account of its comparative freedom from moisture and its high percentage of carbonate of lime.

Maryland Furnaces

There are in the state of Maryland four blast furnaces of a daily capacity of about 350 tons of pig iron each. All the iron produced in that state is made in these stacks. Sixty years ago, Maryland had no less than 31 active furnaces and their combined capacity was 70,000 tons a year, or as much as the four now in blast can make in two months. All those old stacks, which averaged about six tons of iron per day, and whose ruins now dot the state, produced iron from brown-ore banks that were then active, and all of which lay within a few miles of the stacks. In those days there were many stacks in the city of Baltimore and the ore to run them was mined within 30 miles of the city. Now those ore banks are deserted, and the four great furnaces of Baltimore receive their ore supplies from foreign mines, situated more than 1000 miles away on the Caribbean sea. The Lake Superior district is largely responsible for this and other similar changes in the iron trade.

New York Clinton Ores

In the Clinton ore district of New York state, where the iron content of the ore is about 40 to 45% dry, they are removing an overburden that is from 10 to 20 ft. thick, half of it consisting of a hard limestone which must be blasted before removal by the shovels, in order to get at a thickness of about 2 ft. of ore. This ore dips flatly into the earth, and they are now trying to figure out how they will be able to follow the ore to a depth of 500 ft. vertically, underground. This will mean a distance of four or five miles from the outcropping. This Clinton ore district of New York State, about which we hear little, and from which but a trifling quantity of ore is now taken, is estimated to contain not less than 500,000,000 tons of merchantable ore.

Eliminating Phosphorus in Concentrating New York Magnetites

In New York state there are large deposits of low-grade magnetites, running, say, 40% iron and up to 2% phosphorus, that are being made into high-grade bessemer ore by the elimination of the contained apatite, which is the mineral carrying the phosphorus. They have produced so far, of New York magnetic ores from this Appalachian field, more than 35,000,000 tons of ore, showing it to be a most important field. At Mineville they are now concentrating these 2% phosphorus ores at the rate of 1,000,000 tons per year, which is the capacity of their mills when working one shift per day. In these mills they are bringing their 40% ore up to 65%, and their 2% of phosphorus they are reducing to 0.03%, and they are making a product that does not vary from one month to another more than four or five one-thousandths of 1% in its phosphorus content. Such close work seems almost uncanny. When one considers the vast probabilities of low-grade magnetic ores on Lake Superior, now unused, he appreciates the possibilities of such applications to the reserves of this region.

Developments in the Black Hills

Special Correspondence

Promotion of a mine in the Black Hills of South Dakota has been undertaken by the Deadwood Business Club, after more than two months spent investigating many properties. Upon the final report of the investigating committee it was decided to accept the offer of the owners of the Heidelberg group, which was to give to the club one-half interest in the property, provided $5000 was raised for development. Fifty members agreed to advance $100 each, in monthly payments. To raise the money among a few men was not the desire, but to give many an opportunity to contribute. Work was scheduled to commence Sept. 1 and continue through the winter. The property is regarded as one of the best prospects in the Black Hills, having shown up well in the meager developments which have thus far been made. Sampling shows the ore to be of excellent milling grade, while some could be profitably shipped to smelters. It is the intention of the club to develop the mine to such a degree that it can readily be sold, and it is believed that this can be done in six months.

The property is in a rough part of the country, and the first work will be the construction of a wagon road, expected to cost about $700. Toward this work the county commissioners have appropriated $250. The property consists of 185 acres, including some timber and a good millsite. It is traversed by Two Bit Creek, which carries enough water to supply a large mill. Administration of the affairs will be left to a board of five trustees, of which the owners, John Treber and A. T. Roos, will be members. The club will select two members and these four will select the fifth man.

Preparing for Winter Work

At the Titanic property, in Carbonate camp, a steam hoist is being installed, which, with the air compressor, will be run by steam from the Iron Hill plant, 150 ft. distant. The shaft is 100 ft. deep, and water has commenced to show in the shaft. It is proposed to unwater the Iron Hill shaft to the 300-ft. level, believing that this will drain the Titanic workings, and as soon as a skip is completed and coal delivered, draining will be commenced.

Lessees on the Ironsides property, on Squaw Creek, are preparing for an all-winter siege in the snow. Ore-bins are being built in which the ore mined during the winter will be stored. This work will be completed before snow falls and until then shipments will continue until the roads become impassable. Three cars of smelting ore,

the poorest of which was worth $30 per ton, were shipped in August, and two cars of milling ore were to be loaded for shipment to the Golden Reward mill, in Deadwood.

Wasp No. 2, at Lead, paid its regular dividend of 1c. per share Aug. 14. The mine is being operated regularly at full capacity, 500 tons per day, and a good surplus fund is being accumulated. The New Reliance, at Trojan, is dropping 30 stamps on milling ore of good grade. The ore is quite hard, and is crushed fine, so that the daily capacity is a little under 100 tons. Lately diaphragm pumps have been installed to replace the air-lifts for moving pulp from tank to tank in the continuous decantation of slime. Manager Bowman states that this change resulted in saving electricity; the pumps do not require as close supervision as the air-lifts. The ore supply is being drawn from workings near the top of the hill, and will come from there until cold weather sets in, when the scene of operations will be changed to the tunnel workings directly at the rear of the mill.

Cheap Milling at the Bismarck

The Bismarck mill, at Flatiron, is operating at full capacity, 300 tons daily, and is making a profit. The ore is mined by gloryholing and is trammed to the mill, where, after coarse crushing, it is leached with cyanide solutions. The costs of mining and milling, including general expenses, averaged only 95c. per ton during one month this summer. This figure did not include repairs, for which item expenditures will increase as the mill gets older, but, on the other hand, some economies may be effected which will offset them; for instance, a mechanical-haulage system eliminating horses to haul the ore between the mine and the mill. On the basis of present operations the property is earning a good profit.

The Golden Gate property, at the head of Blacktail Gulch, is being sampled by W. T. Boley, representing the Chicago owners. The old workings have been unwatered and carefully sampled. Mr. Boley is also making a thorough examination of a bed of quartzite which outcrops at the south end of the ground, believing that it will be possible to mine on a large scale. The bed is 20 ft. thick. It is quite probable that a mill will be built.

Exploratory work at the Elliptic, which is under bond to the Strattan Venture Corporation, headed by Frank S. Strattan, consists of reaming out the diamond-drill hole which is claimed to have produced high-grade cores in the past. The hole was drilled to a depth of 800 ft. from the bottom of a 600-ft. shaft, and it was from the bottom of the hole that the good cores were produced. At present the reaming has been completed to a depth of a little more than 600 ft. below the collar, progress having been slower than was anticipated.

The Homestake Mining Co. declared monthly dividend No. 416, Aug. 15, constituting a record in the annals of gold mining. Starting its dividend disbursements in October, 1878, they have been continued each month with the exception of two short periods, when, from extraneous causes, the mine was closed. September included, the company will have completed 35 years of dividend payments. It is interesting to note that the present dividend is one of the biggest ever declared, amounting to 65c. per share on 251,160 shares issued. The Homestake probably has greater ore reserves than any other gold mine in the world, approximating 30,000,000 tons, or enough to operate at the present capacity for 20 years. All this ore is above the 1900-ft. level. From the lowest levels some of the richest ore ever found in the mine has been produced.

❋

Lime Production in 1912

Although the production of lime in the United States, in 1911, was considerably less than in the two preceding years, the increase in 1912, as reported to the U. S. Geological Survey, was more than sufficient to counterbalance the reaction of 1911. The total production for the year was 3,529,462 short tons, as compared with 3,392,915 short tons in 1911, which represents an increase of 136,547 short tons.

The total number of plants operating in 1912 was 1017, as compared with 1139 in 1911. This decrease in the number of producers was due, in large part, to the inactivity of small kilns operated by farmers for burning lime for local use in soil treatment, and in part to the tendency of the industry toward concentrating plants into fewer and larger units. The heaviest decrease in the number of producers was in Pennsylvania, where 561 were reported operating in 1911 and 474 in 1912, a decrease of 87. The five leading lime-producing states in 1912 were, in the order of production, Pennsylvania, Ohio, Wisconsin, West Virginia and Maine. Maine has supplanted Missouri, which occupied the fifth place in 1911, in the quantity of lime produced, but ranks seventh in the value of production, which is one place lower than Missouri.

The hydrated-lime business exhibited a marked advance in 1912. The quantity of hydrated lime produced was 416,890 short tons, as compared with 304,593 short tons in 1911. This increase of 37% in a single year, in spite of a decrease in the average price per ton, speaks well for the strength of the hydrated-lime business. The number of lime-hydrating plants in operation, in 1912, was 64, an increase of four from 1911. The operating plants are located in 20 states, and there are idle plants in a number of other states.

Lime imports into the United States, in 1912, were 4268 short tons, as compared with 5232 short tons in 1911, a decrease of 964 tons. Exports were 260,669 bbl. of lime, as compared with 207,232 bbl. in 1911.

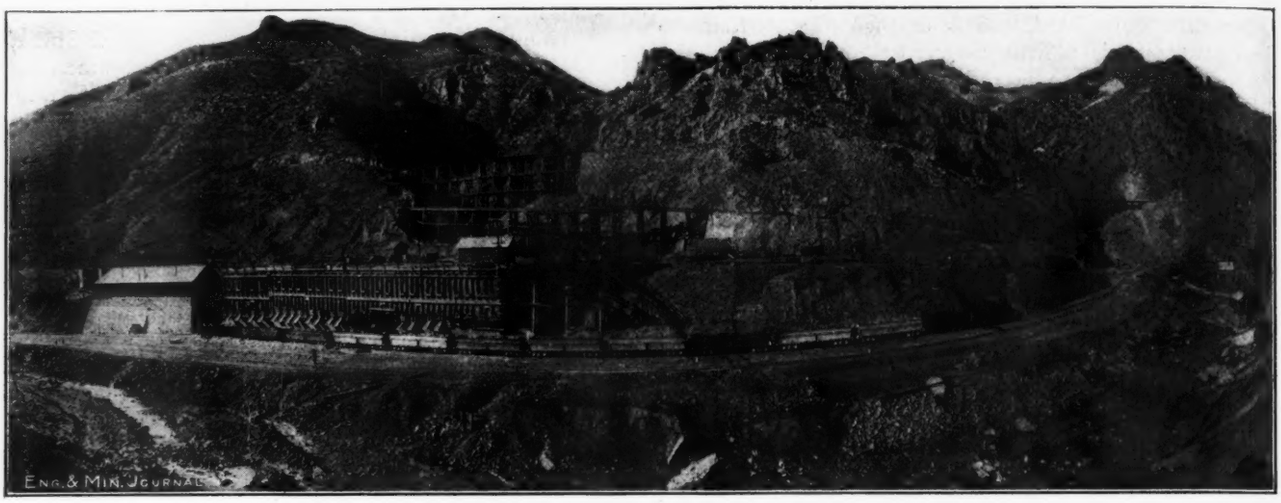
❋

Swedish 1912 Mineral Output

The official report of the Swedish mineral output for 1912 shows the following: Iron ore, 6,700,565 metric tons; zinc ore, 50,036; silver-lead ore, 2877; iron pyrites, 31,835; manganese ore, 5101; copper ore, 3059 metric tons. Of the iron ore produced, 4,521,460 metric tons carried between 60 and 70% of Fe, and 1,247,626 tons more carried between 50 and 60% Fe.

The metal production, excluding iron, was: Copper, 3957 metric tons; zinc, 3228; lead, 1072 metric tons; silver, 961 kg.; gold, 30 kg. Other products and byproducts of the mineral industry were: Zinc sulphide, 33,522 metric tons; copper sulphate, 870; feldspar, 34,305; quartz, 22,365; alum, 144; ferrous sulphate, 335; graphite, 79; powdered pyrolusite, 62 metric tons. All figures are arranged in order of descending value.

PHOTOGRAPHS FROM THE FIELD

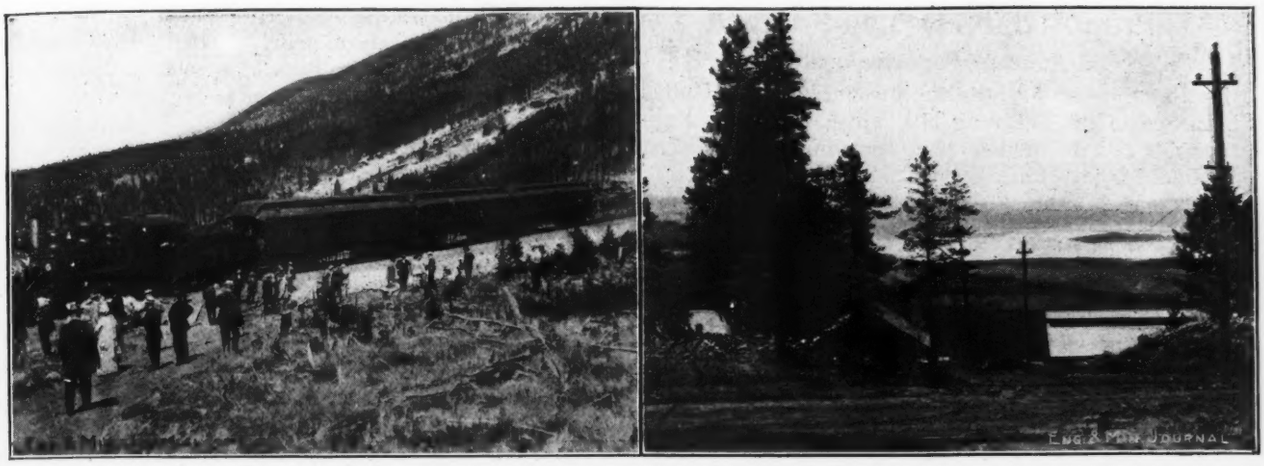


LONGFELLOW TRANSFER BETWEEN CLIFTON AND MORENCI, ARIZ.

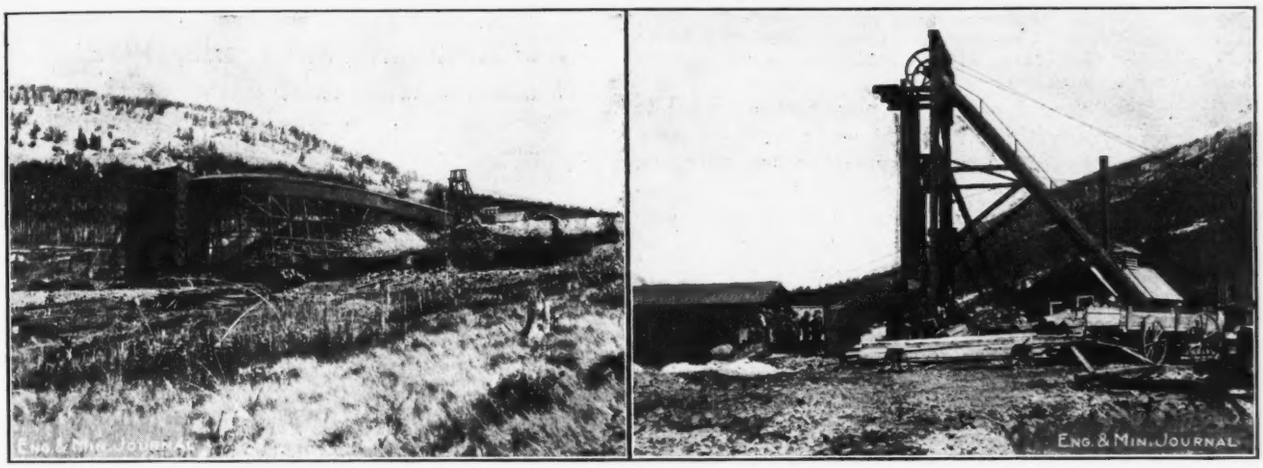
The transfer is at the foot of the Longfellow incline on the Shannon-Arizona and Coronado railroads. The Longfellow mine is in the background at the right.

THE BRADEN COPPER CO. PROPERTY IN CHILE

General view of Molino, formerly Graneros, site of town, concentrator, and smelter; in the immediate vicinity are the mines.



THE ENGINEERS' SPECIAL AND VIEW FROM SOUTHERN CROSS MINE



OREBINS AND HEADFRAME, SOUTHERN CROSS MINE OF ANACONDA COMPANY

The Southern Cross mine, 20 miles west of Anaconda, was visited Aug. 21, by members attending the Butte meeting of the American Institute of Mining Engineers.

CLIFTON, ARIZ., COPPER KING AND POLARIS MINES IN DISTANCE

The old smeltery of the Arizona Copper Co. is to the left.

Proposed New Land Law

LOS ANGELES CORRESPONDENCE

Senator Smoot, of Utah, has introduced in the United States Senate the following bill, which has aroused apprehension and discussion among some miners, who affect to see danger in certain provisions:

Be it enacted by the Senate and House of Representatives that where a grant of lands in place has heretofore been made, or may hereafter be made, to any state in aid of public schools, the governor of any such state may cause to be listed with the Secretary of the Interior any sections, or parts of sections so granted, and it shall be the duty of the Secretary of the Interior to examine such lists, and if the lands are found to be of the character so granted, and free from valid adverse claim, initiated prior to the survey of the township in which they are situated, to certify the same to the state entitled thereto in further assurance of title. Provided, that no such list shall be certified until the state shall have published for a period of 30 days, in a newspaper of general circulation in the vicinity of the land, a notice of the filing thereof, and that as the lands hereafter surveyed such publication shall not be made until after the expiration of three months from the filing of the township plat of survey in the district land office; provided, further, that nothing herein contained shall be so construed as to postpone the time of the attachment of the grant of such lands under existing law.

On its face the act appears to have been designed to help states in perfecting title to the lands that have come to them from the federal government for school purposes, but men eminent in the law, attorneys who have had extensive practice and experience in the land courts, profess to see a "joker" that might result disastrously to the mining industry. The miners and attorneys interested in mining law do not blame Senator Smoot for the introduction of the measure. They realize he is not a lawyer and that he is undoubtedly ignorant of the danger to miners that lurks within the provisions of his act.

Under the Smoot act, the present policy of the government toward the prospector and miner, dating from the inception of the present system of mining laws, inaugurated in 1866, will be reversed. By that system, mineral lands have been exempted from school and railroad land grants. This was done to facilitate the development of the mineral industry, which has been such a factor in the growth of the Pacific Coast.

Some of the best mineral lands in California have been found on school and railroad grants, and even in Senator Smoot's own state, some of the greatest mines at Park City, Tintic, Bingham and other places have been included in school grants. Under the existing law mineral lands are segregated when discovered, and the state is empowered to make lieu selections. There is no objection to this procedure because when the government assigned these lands to the different states it was not cognizant of their character. But the government has guaranteed protection to the prospector and miner to the extent that when land is discovered to be mineral it is withdrawn from land grants to states and railroads.

A close analysis of the Smoot bill shows a possibility that the law and method of procedure may be materially changed, and the change might be disastrous to the mining industry, and work a great injustice to the prospector and miner. He complies with the requirements of the federal laws and records his claim with the recorder of the county in which it is located, but there is no way by which his claim may be recorded in the United States district land office. The claim may be surveyed or unsurveyed lands for all he knows, it may be on a school selection or a railroad grant, but he is not cognizant of the fact until he makes application for patent, when serious complications are likely to arise. If the miner's claim is on a school grant, it may have been sold by the state to someone else without his knowledge because there is no record of his claim in the United States district land office to show that the land has been appropriated for mineral. If there is to be a change or revision in the mining laws it should be in favor of the prospector and miner. The state is well protected in its grants; the burden of proof is on the miner in all contests and hearings in the land courts, and there should be no further impositions forced upon him.

The Salt Lake Commercial Club has taken the matter up in earnest and has adopted strong resolutions opposing the Smoot bill and asking the Senator to withdraw it. Similar organizations throughout California should take a stand and the strongest influence and pressure should be brought to bear on Congress not to jeopardize the mining industry of the Pacific Coast by its passage.

Swedish Iron Trade, 1912

There were 6,700,556 metric tons of iron ore produced in Sweden in 1912. Of this, 5,945,394 were considered first class. No less than 4,521,460 tons carried 60 to 70% Fe; 1,247,626 tons carried 50 to 60% Fe. There were 4,863,666 tons carried 0.1007% or over of phosphorus, and 1,055,011 tons carried 0.030 to 0.050 of sulphur, 4,013,532 tons carried under 0.020 of sulphur, and 192,676 tons carried from 0.020 to 0.030 of sulphur.

The Swedish iron works consumed for the entire production of iron 43,219,576 hectoliters of wood charcoal; 359,584 tons of coal, 136,472 tons of coke, and for the production of ingots, 337,321 metric tons of pig iron and 212,143 metric tons of scrap iron.

The production was divided as follows, the items being arranged in descending order of value: Pig iron, 699,816 mtric tons; openhearth ingots, 404,118; steel and iron bars, 182,608; iron bars, 148,828; rods and hoops, 86,194; bessemer ingots, 107,254; castings for drawing weldless tubes from, 49,063; wire rods, 52,541; cast iron, 45,194; sheets, 25,560; crucible and electric-furnace steel, 3941; total, 1,805,117 metric tons. There were also 5906 metric tons of ferrosilicon and 997 metric tons of silicospiegel produced. The average Swedish blast furnace produces 20.07 metric tons of pig iron per day.

Goldfield Consolidated

Report of Goldfield Consolidated for July, 1913, shows a total production of 29,550 tons. From this amount $168,755 was realized, $48,725 through mining operations and $120,030 through milling.

Development cost $5.84 per ft., a total of 3430 feet having been performed. Combined operating costs are shown in the accompanying table.

Mining:	Mining	Milling and Transportation	Total
Stoping	$2.86	.....	$2.86
Development	0.68	.....	0.68
Moving dumps	0.06	.....	0.06
Transportation	.....	0.08	0.08
Milling	.....	1.91	1.91
Marketing	.....	0.05	0.05
General expense	0.39	0.06	0.45
Bullion tax	0.04	.....	0.04
Construction	.....	0.03	0.03
Marketing ore shipped	0.71	.....	0.71
Total costs	$4.74	$2.13	$6.87
Miscellaneous earnings	0.04		0.04
Net costs	$4.70	$2.13	$6.83

CORRESPONDENCE AND DISCUSSION

Relation between the Composition and Physical Properties of Cast Iron

In an extremely interesting article by "Ironkem," on p. 1206, of the *Iron Age* for May 16, 1912, the following occurs:

"The analyses of two lots of No. 2 cast iron are given, together with their breaking strength as follows:

	Close Grained No. 2	Open Grained No. 2
Silicon	1.00	1.10
Manganese	0.38	0.53
Phosphorus	0.112	0.116
Sulphur	0.009	0.023
Graphitic carbon	2.72	3.16
Combined carbon	0.99	0.68
Total carbon	3.71	3.84
Breaking strength of 1¼-in. round pins on 12-in. centers:	4950 lb.	2750 lb.
	4500 lb.	2700 lb.
	4300 lb.	2700 lb.
		2750 lb.

The writer, who is evidently a master of his subject, produces this as evidence to show that "two irons of identical analyses made in the same furnace, from the same ore mixture, can have vastly different physical properties."

I call attention to the fact that there is no such closeness in these analyses as the writer evidently thinks. On the contrary, it appears to me that the difference in composition goes a great way toward explaining the difference in physical properties. In the first place, the weak iron has 0.44% more graphite than the strong, which in itself is an element of weakness; in the second place the weak iron has a combined-carbon content of 0.68 as against 0.99 for the strong iron. In other words the metallic matrix of the weak iron is that of rail steel, whereas the matrix of the stronger iron is equivalent to 1% carbon steel, which is, of course, much stronger than rail steel.

Adding to these differences the great difference in the structure, we need not wonder that one iron is so much stronger than the other, and that there is such a difference in the structure of the irons need surprise no one. A slight difference in temperature between the two irons as they run from the furnace might lead to such variations of structure, the hotter iron cooling more slowly than the other. We have by no means reached the end of knowledge in these matters, and we cannot as yet explain fully all the variations in properties. We cannot do this fully even in the simpler case of steel, but we can explain a large part of it.

HENRY M. HOWE.

Columbia University, Aug. 11, 1913.

A Caution to Buyers of Steel

A coterie of European steel bunco men has been reported to be again active in this country. Anyone solicited for a trial order of a special-process, foreign-made, drill or tool steel, for which phenomenal claims are made and an extraordinary price is asked, would do well to exercise extreme caution against being swindled.

I will gladly inform anyone who has been so approached whether or not the steel company that has solicited an order is in any way affiliated with the particular group of individuals to which I refer.

C. CARLETON SEMPLE.

Stamford, Conn., Aug. 30, 1913.

What the Union Has Done for Butte

In connection with the present Michigan strike, there have been numerous comparisons drawn between conditions in Butte and Michigan. Having read misleading statements about conditions in Butte and other Montana communities, I believe I should correct them and make a true statement of conditions, together with a brief résumé of the relations between the Western Federation of Miners and employers in Montana. The Butte miners' union was organized June 13, 1878. A minimum wage of $3.50 for all underground workers was established, men doing development on contract averaged from $5 to $7 per day, the minimum or union scale being guaranteed.

Thirteen years ago the Montana legislature enacted an 8-hr. day for all underground workers, mill and smelter men and reduction-works employees. John D. Ryan, president of the Amalgamated Copper Co., extended the 8-hr. day to all surface workers; even watchmen work 8 hr. only. An agreement was entered into between the local unions of the Western Federation of Miners in Butte, Anaconda and Great Falls and all the mining corporations of that district, June 1, 1912, wherein a minimum of $4 per day was established for all underground workers when the price for copper was 17c. or more; and $3.75 when exceeding 15c. but under 17c. per lb. The $4 wage was paid during nine months of the last year and $3.75 is the present minimum; $3.25 is the minimum for surface labor. Mechanics, machinists, carpenters, blacksmiths and boiler makers get $4.75 for eight hours. Men on first-motion hoists get $5, compressor men $4.50, and $4 for firemen.

The cost of living is being harped upon as being greater in Butte than Calumet. Single men in Butte pay $1 per day for board and room, and the accommodations include modern conveniences such as electric light, steam heat and baths; 80% of the married men own their own homes. Those who rent houses pay from $12 to $20 per month; the rent is estimated on the size and conveniences and includes water. There are no company houses. Men have an incentive to build homes and have a place to call their own and are not subject to eviction when they displease the boss. Meats and other necessities are cheaper in Butte than in the copper country of Michigan. Meals are cheaper in restaurants in Butte than in Calumet. A miner has more left of his daily wage after paying living expenses than the best-paid miner receives in the copper country for his entire daily wage. We have read that miners average

from $3 to $3.50 in this district. I have a number of monthly statements of miners working in different mines in Michigan and the highest does not exceed $65 and others range down to $29. How a man can support a family on such a wage is inconceivable. Compare this to a minimum of $112 paid to the men working in the Butte mines. If I were to use the same method of computation as the operators in Michigan I would put the wage of the Butte miner at $5 to $7, as that is earned by about 2000 of the underground workers of Butte.

During the 35 years that Butte miners have been organized, not one day's shutdown occurred due to any grievance with the employers. Can Michigan show such a record during the last 35 years of its unorganized state? Thousands of former residents of Michigan who were driven from that state by the intolerable conditions of employment are now residents of Butte, which is the best evidence of comparative conditions. The monthly dues are $1 and union miners are assessed whatever amount may be necessary whenever men are elsewhere fighting for better conditions. Out of the money so collected the union pays to its sick members $10 per week, and at death $90 for funeral expenses. In addition to this, special donations of $400 to $500 are paid to members who receive great bodily injury or long-continued sickness; $100,000 is paid yearly by the Butte miners' union alone for such purposes, and no member of that union filled a pauper's grave during the last 35 years.

The business men of Butte are the most prosperous in the country and the general *per capita* prosperity of Butte is the highest in the United States. I would suggest to the local business men who are so anxious to serve the corporations in Michigan to inquire of the Butte chamber of commerce as to the standing of the Western Federation of Miners in that district.

The local managers in Michigan say they will not deal with the Western Federation of Miners. Paine, Webber & Co. control the East Butte Mining Co. and are interested in the Butte & Superior Mining Co. Both of these companies have agreements with the Western Federation, as have all other companies in the district. Paine, Webber & Co. also control the Copper Range Consolidated and Manager Denton says he will not deal with the Federation. Why is it right in Butte and wrong in South Range. Denton, if transferred to Butte, would gladly do business with the Western Federation of Miners as others do. D. C. Jackling, of the Guggenheim interests, loudly proclaimed a year ago that he would not recognize organized labor: one week later as manager of Butte & Superior, he entered into an agreement with the Butte miners' union to pay $4 per day to his underground workers. It may be well for local managers to learn wisdom by the experience of others. I would also suggest to some of the clergymen of Michigan that they inquire of the clergymen of Butte, Anaconda or Great Falls, what is thought of the Western Federation of Miners in those places, before passing judgment on matters they are not acquainted with.

WILLIAM LAKELAND,
Secretary, Miners' Union, No. 22,
Western Federation of Miners.
Greenwood, B. C., Aug. 26, 1913.

Discovery of the Maas Iron Mine

In P. B. McDonald's article, "Applied Geology, Michigan Iron Ranges," in the JOURNAL of Aug. 2, 1913, my discovery of the Maas mine is cited as an example of luck. I object to such a statement, because every drill hole that I put down was located after a diligent study of the geology of the district, supplemented with careful examinations of conditions in the adjoining Negaunee mine to the southeast, and the Hartford mine to the northwest. I also had data of explorations by diamond drilling conducted by the Lakeside Mining Co. close to the east shore of Teal Lake about the year 1889. About one year previous to this I had charge of diamond-drill work still farther east on the Muck farm, conducted by my father, the late J. B. Maas, after whom the Maas mine was named, by his friend, William G. Mather. It is true that I had a sketch by a German, but it was not marked "Here is a good place to look for iron ore." The sketch was made by me in following lectures of Dr. Wedinger, in the School of Mines, in Berlin, Germany, and indicated the probable line of contact between the Negaunee iron formation and the Siamo slates in the flat ground lying between the Negaunee mine and Teal Lake.

Working with this sketch as a basis, I started drill holes on the Muck farm in 1888, but discovered the contact much farther south than the professor had supposed. After sinking three drill holes, all in Siamo slates, working from the north, we cut the iron formation and some lean ore, but the price of ore at that time did not warrant further explorations through an immense body of quicksand. In 1898, when I started diamond drilling on what is now called the Maas mine, I not only had access to all known geological information, but had information of the lower levels of the Negaunee and Hartford mines, and the results of the Lakeside Mining Co.'s and my own previous drilling.

It is, then, not surprising that every one of my drill holes were started in the hanging and inclined toward the Siamo slates and Ajibik quartzite. However, it was only the third drill hole that cut ore, because the ore is capped sometimes to a great depth. In the explorations west of the American mine, every hole was started in the Goodrich quartzite and pointed at an angle to the north to cut the Siamo slates and Ajibik quartzite. These holes were located after a careful study of the geological conditions and as the overburden was like the case of the Maas mine, more than 200 ft., it must be conceded that there was more "applied geology" used in both these explorations than "luck."

GEORGE J. MAAS.
Negaunee, Mich., Aug. 28, 1913.

Power Required for Electric Smelting

An electric-smelting test on Copper Reef ores, recently made at Globe, for the Pittsburgh Electric Furnace Co., was noted in the "Mining News" pages of the JOURNAL of Aug. 30, wherein it was stated that about 3500 kw. was required per ton of charge. While the other statements made are correct, the power requirements actually amounted to 350 to 500 kw., depending upon the nature of the charge.

Pittsburgh, Sept. 3, 1913. R. S. WILE.

EDITORIALS

The Zinc Schedule

Several weeks ago we called attention to unfortunate phraseology of the zinc-ore schedule of the pending tariff bill, which would have resulted in importers of such ore paying a double duty. In order to correct this, Senator Thomas, on Sept. 2, introduced an amendment, adding the words "upon the zinc contained therein" after the words "ad valorem" in paragraph 164, line 14.

This is a simple and ingenious rectification which will probably straighten out the matter insofar as the zinc smelters are concerned, although the customs appraisers may have some difficulty in determining the value of the zinc in certain ores. Anyway, the importers are clearly relieved of paying duty on the silver, gold and copper contents of such ore, and of paying twice on lead contents.

After a brief discussion Senator Thomas' amendment was agreed to with the remark by Senator Thomas that "if anything needs rectification it can be easily returned to."

We think that some further rectification is necessary in order to insure justice to the lead and copper smelters. As appears from the discussion in the Senate on Sept. 2, it is the intention to assess a duty on lead ore under paragraph 154 and on zinc ore under paragraph 164. It is clearly the idea that lead ore and zinc ore are two different things.

However, paragraph 164 specifies not zinc ore, but zinc-bearing ore, and as amended provides for an ad-valorem duty upon the zinc content of such ore. Now, lead ores and copper ores are frequently zinc-bearing. Will the collectors of customs attempt to levy upon the zinc of such ore or will they be convinced that the zinc content in this case is of no value and consequently undutiable?

Section 164 as amended is a great improvement upon the original, but evidently there will have to be administrative rulings respecting it and probably cases will come up in litigation.

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The Situation in Copper

We are at the present time witnessing a remarkable situation in copper, the world's stock having been reduced to the lowest figure on record since the American statistics have been reported, while the demand for consumption continues unabated. The statistical position was already strong before the Michigan strike occurred. The cessation of copper from that source was felt very quickly, inasmuch as that copper does not have to be refined electrolytically and goes directly from the smelteries near the mines to the consumers. Whereas in the case of electrolytic copper about three months from mine to consumer is a normal time, Lake copper is ordinarily less than a month in transit.

It appears now that the Michigan strike is going to be a long drawn-out affair. Even if it were settled tomorrow it would be many months before the former rate of production could be regained. Many of the mines are filling with water and the exodus of miners from the district will produce a shortage of labor that will check operations for a long time. Eventually the companies will probably have to offer higher wages in order to secure the men that they want. In the meanwhile the producers of electrolytic copper can offer only partial assistance inasmuch as the refineries of the country are already being operated at nearly their full capacity.

The copper market has consequently worked itself into a dangerous position and if consumers should become unduly excited they may develop highly uncomfortable conditions for themselves. The producers are sincerely, we believe, seeking to prevent that, realizing that in the end they always have to suffer from excesses. There will probably be a further advance in price, but it is hoped that there will be no runaway market. In view of the existing financial and industrial situation, which is not what it should be either in Europe or America, there will probably be no runaway market. The gradually increasing business recession in Germany will be a tempering influence, as will be also the absolute absence of any prospect of a boom in this country, where the partial failure of this year's harvest has checked all ideas of business expansion. However, there will, no doubt, be a very strong copper market for some months to come simply because of the restriction of production, the Michigan and Mexican troubles having come to a head just when stocks had already been reduced to a smaller quantity than it was thought a few years ago the requirements of commerce would permit.

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The Situation in Spelter

Spelter has experienced a considerable rise since the beginning of summer and it is thought in the trade that the rise will go further. The improved situation results from the emerging of the galvanizers and brass-makers from their previously overbought condition, the maintenance of a large consumption and the reduced production on the part of the smelters. The smelters are now in no enviable position, owing to the contraction of margin between the value of spelter and the value of zinc in ore, which leaves them little or no profit. This results from the shortage of ore supply west of the Rocky Mountains, where Butte is the only district offering increased quantities. On the other hand, the Mexican supply is practically cut off. Outside of Butte no new supplies of ore of any great consequence are in sight. Therefore the miner is at present having things all his own way and is reaping all the benefit of the advance in spelter.

With the passage of the new tariff bill, now only a few months away, and the reduction of our bars against European spelter, a further advance in our market just now may appear unjustified. In indicating the European situ-

ation, the following from a recent number of the *Ironmonger* is interesting:

> It may be assumed that the Convention which regulates the output, and to a large extent controls the prices, will be continued, although there is room for great difference of opinion as to the policy which it will eventually adopt in respect of selling prices and the manipulation of production on the Continent. Judging from external indications there has been no small amount of friction among the chief parties represented in the Convention, and the conditions of the market are now of a very complex character. An eager demand has been attracted from numerous quarters lately owing to the abnormally low prices which have ruled, and under ordinary conditions this demand would probably have resulted in a very smart uplifting of prices. It is true that the price of spelter for forward delivery was at one time raised to a notable extent, but afterward there was a sharp setback. So long as the stocks on the Continent under the control of the Convention remain heavy and so long as the Convention is ready to meet the demand of the trade there is no reason for a runaway market, even if requirements of the trade should become exceptionally pressing. Consumption is proceeding on a much larger scale than during the earlier months of the year and if it continues at approximately its present rate the disappearance of the surplus stock may be only a matter of time, although only the Convention knows the extent of that stock.

A few months ago the unsold stock of the Convention was very large indeed, but during recent months it has been reduced materially, and probably is no longer a serious menace to the American market after the reduction of the tariff. Indeed the hopes of a further advance in our own market are based upon the expectation that the European price will rise to £23 or higher. However, while there is good ground for optimism as to spelter, the present is no time for the indulgence of extravagant hopes. We may see 6c. for spelter ere long, but probably it will be many a month before we may expect 7c. again if the precedents of the past are to hold good.

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Scientific Management for Mines

The question of applying to mining the principles of scientific management is frequently raised. Their adoption is enthusiastically urged by well meaning amateurs and rejected quite as emphatically by stand-pat managers. It is a fact that of all main lines of human industry, that of mining seems least amenable to this new method of treatment. The great difficulty lies in the continually changing conditions which are inherent in the industry and unavoidable. The essence of scientific management is standardization, finding out how to do a thing most economically and then so doing it many thousand times until the cost of finding out has been paid for by the total saving. But rocks and orebodies unfortunately will not standardize and their refractoriness thus is transmitted down through the whole scale of mining operation. How to establish a standard rate of drilling, for instance, when the rock varies in hardness from inch to inch? How to prescribe the most efficient method for setting up a rock drill when the dip of the foot wall, the thickness of the vein, the reliability of the hanging may change over night? How, when outlining the time cycle for a shift's drilling, to allow for the time consumed in passing a troublesome slip?

To a less degree, other characteristics of mining operate against the adoption of the methods of scientific management. Such are the feeble illumination, the scattered workings, making supervision difficult, and especially the temporary nature of all mining, which discourages initial expenditures. It is no wonder, then, that the mine manager has not rushed to welcome the efficiency expert. The limitations on his methods are too evident. It is however, foolish to reject a half loaf from failure to get the whole. There are many mining operations capable of standardization, where great economies could be effected by time study of the various units involved. One such in particular in hand tramming. It is an operation, unluckily, which no mine can quite eliminate, but which it often succeeds in thoroughly neglecting; yet it is the one important manual operation in mining in which reasonably uniform conditions are met. Spotting cars, loading, pushing, discharging, are all performed in about the same way day after day in all parts of the mine. An opportunity for analysis, time measurements and study exists here, and if work of this nature were done, we should know a great deal more about the elements that enter into hand-tramming costs, where at present we know little or nothing.

The size, weight and relative dimensions of an ore car are decided by guess. The type of bearing is chosen after asking the foreman. It is assumed that the proper track grade should result in about the same effort by the trammer, whether pushing the loaded car down grade, or the empty car up grade. This is about one-half of 1%. Left to themselves, the trammers would probably select a steeper grade, preferring to ride the loaded cars and work harder pushing back the empties. It may easily be that the trammers are right. Mr. Taylor found that in loading pig iron, periodic rests greatly increased the total which it was possible for one man to handle. One fact, which might be made more emphatically evident by the presentation of figures, is that the average mine track is sadly neglected. Too light rails are used, too little attention is paid to grade, and curves are often more nearly angles.

Switches in particular are often put in according to prejudice, and by promoting derailments and encouraging delays, reduce appreciably the efficiency of the trammer. The whole question of switches is more or less in the air. What is the choice between slick sheet, switch and turntable? If a switch be used, shall it be a double-point stub, a double-point split, a single-tongue, or shall it be fixed in position? If movable, shall it be thrown by hand, by foot, by lever, or shall it be automatic or semi-automatic? The choice of these various types is a matter of cost in the last analysis, the first cost balanced against the time cost of manipulation. But figures on manipulation costs can be had in these operations only by observations with a stop watch.

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Respecting Ore Grinding

The fact that the Homestake mills in the Black Hills use stamps for crushing has long been a strong argument in their favor. Too little attention is given to circumstances which alter cases. That a large mill uses stamps is no reason why a smaller or larger one should do the same. That a crushing machine is best adapted for a particular service is no reason why the same machine should be best for performing a different function. It is interesting to note that the new Mogul mill, which is to be built in the Black Hills, will use the same crushing machines formerly installed in the old plant, chilean mills.

BY THE WAY

The employees of the U. S. Steel Corporation, appreciating that wages have been steadily increased by the corporation, and being apprehensive of what might happen in the event of dissolution, are circulating a petition asking the government to drop its suit. It is said that more than 150,000 names have already been secured. This may furnish the government with the needed excuse to discontinue an action for which there never was any popular demand so far as we have been able to make out.

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The Department of Justice has agents in Colorado interviewing ore producers with respect to their treatment by the American Smelting & Refining Co. They have been informed by important producers that the smelting company is considered to have been fair in its operations, that a reasonable share of the benefits resulting from improvements in the art of smelting have been passed on to the ore producers, and that such complaint as exists comes from small producers who are often too ignorant to figure out an ore-settlement sheet. With respect to the erstwhile competing smelters at Golden, Florence and elsewhere, the Washington officials, previous to the advent in Colorado, appear to have received information that can only be characterized as weird.

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Respecting the recent very foolish war-scare, the *Evening Post* remarked that money, or the facilities for raising money, are in these days essential preliminaries to making war. Since Mexico could not therefore attack the United States, there could be no war unless the United States attacked Mexico—which we clearly had no intention of doing. This last way of judging probabilities was quite in Wall Street's line. Wall Street as a community is in touch, directly or indirectly, with the people who lend to governments like Mexico. It was therefore able to conclude that Huerta could do nothing whatever in the matter short of appearing before the Pujo Committee to complain of being forced out of business by the Money Trust, despite his moral right to have the money. And even the Pujo Committee was no longer in session.

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We do not understand why good raw material for stock-jobbing purposes is allowed to go to waste. We have had reports out on the giant kelp of the Pacific Coast as a source of potash for nearly two years; the technical magazines, the Sunday newspapers, and the Government bulletins have howled about the necessity of potash for the American farmer, and yet we have not yet received a single letter offering

5% first-mortgage sinking-fund gold bonds;
6% second-mortgage unsinkable silver bonds;
7% debenture copper-plated bonds;
8% participating preferred stock;
Unlimited common stock;

all in the United Kelp & Potash Co., chartered to acquire marine holdings, to plant, cultivate, harvest, and treat kelp, refine potash and iodine salts, radium compounds, and take in money. Certainly the promotors have gone to sleep at the typewriter.

Tipping at the expense of the government is to cease, so far as the Post Office Department is concerned, with one exception. The individual who may be favored by department officials when traveling on government business is the train porter. Just why Postmaster-General Burleson exempted the porter is not made clear in orders issued today, limiting the expense accounts of post-office inspectors. The Postmaster-General disclosed definite ideas about what hotel waiters should receive. In his instructions is the item: "Tips for hotel waiter—Nothing." As to the piratical craft known as the taxicab, its use at government expense is taboo. Under regulations effective Oct. 1, board and room must not cost more than $5 a day; laundry may be charged at the rate of $1.25 a week, or 20c. per day; while the engaging of a stenographer or typist to aid in preparation of reports is forbidden.

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According to a dispatch to the New York *Sun*, the last shovelful of earth was dug from the Culebra cut at 3 p.m., Sept. 6. It was then expected that all the tracks and equipment would be removed by Sept. 9 and the flooding of the cut begun. It was originally intended that all steam-shovel operations on the Culebra cut proper should cease on Sept. 15 and that by Oct. 5 all the equipment, including 36 miles of track, must be out of the nine-mile channel between Gamboa dike and the Pedro Miguel locks. On Aug. 1 there remained to be removed 998,900 cu.yd. inside the theoretical canal prism, and it was estimated that two-thirds of this would be taken out by Sept. 15. The work on the canal is now progressing rapidly. On Aug. 31 the last barrier at the Pacific end of the canal was blown up by dynamite and that same day several dredges passed through the opening. Work was begun on the last barrier of the Atlantic channel two days later, and when this has been completed ships will be able to navigate to the locks at both ends.

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Out of the mouths of babes may we learn and even from the *Saturday Evening Post*, which tells us that the latest kink in gold-smelting is to cast the gold in conical shapes instead of bars and bricks, with the express purpose of making it difficult for a thief to walk away with a cone. The cones are molded to almost any size, one measuring 1 ft. or perhaps 1½ ft. in diameter on the base. Such a shape is extremely unwieldy. Slings and tongs have been designed to facilitate handling them in the smelting works because they are so clumsy. Our esteemed contemporary continues: "A thief provided with such a sling would have an embarrassing time getting away with a cone in contrast with the ease with which a bar or a brick may be covered up to give it an appearance that will not rouse suspicion. Some slight advantages in molding have also been obtained by using this shape in the Arizona smelting works where it has been adopted." We think that a cone of gold 1½ ft. in diameter might be unwieldy, if of any great thickness. Figure it out for yourself; the specific gravity of pure gold is about 19.3. Also, we are interested in noting that there are gold-smelting works in Arizona, but we wish we knew where they were. On sober second thought, we think we detect a resemblance in the above to one of our own items, p. 805, Apr. 19, 1913, and we do not believe that it was much improved by whomsoever lifted it, without credit.

Gogo Juice and Gold

Gogo juice is obtained from the bark of a Philippine plant, whose botanical name is *Entada scandens* Bentham. According to F. T. Eddington, in the *Philippine Journal of Science,* April, 1913, it is customary for the gold washers in the Philippine placers, who are usually women, to squeeze gogo juice from time to time on the surface of the water in their *bateas.* The belief is that the fine gold is thus caused to settle instead of floating away. Gogo juice is neither acid nor alkaline and its chief constituent is saponin, a complex vegetable poison belonging to a group of glucosides, which are generally colloids. It has the property of holding fine particles in suspension in liquids, of "killing" mercury and of emulsifying oils.

Mr. Eddingfield conducted some experiments to determine the efficacy of the juice in gold washing. He obtained finely divided gold by precipitating it from gold-chloride solution with oxalic acid. Gogo juice added to this solution while the gold was still in suspension had no effect whatever in the rapidity or completeness of its precipitation. Further tests showed that the juice had no ability to increase the adhesion between gold and wood or between gold particles or to reduce the surface tension of water, or to clean the gold by cutting the oil which might be on it. The conclusion is reached that gogo juice has no qualities which make it beneficial in gold concentration, and since it has the ability to "kill" mercury, it is of a positive disadvantage where amalgamation is to be practiced.

A continuation of these experiments, however, showed that the gogo juice was a useful reagent in forming colloidal gold. Red, blue and purple solutions were obtained by the use of this material. This is interesting, in view of the belief formerly held that colloidal gold solutions could not be formed readily by means of a colloid or in the presence of an electrolyte. The juice, or at least the saponin, is a colloid and the colloidal gold was formed by means of oxalic acid, which is an electrolyte. It can be formed from gold-chloride solution by the use of fresh gogo juice and oxalic acid plus heat; or by the use of gogo juice plus heat after standing; or by the use of gogo juice, calcium carbonate and heat.

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Smelting in Bond

WASHINGTON CORRESPONDENCE

Late on Saturday night, Sept. 6, the Senate, which then reported the tariff bill from committee of the whole to the Senate, sitting as a legislative body, adopted a new smelting-in-bond provision along lines already predicted in this correspondence. The amendment, which went through without debate, grew out of the dissatisfaction felt by smelting interests with the way in which the smelting industry was treated in the original draft of the tariff and reads as follows:

That the works of manufacturers engaged in smelting or refining, or both, of ores and crude metals, may, upon the giving of satisfactory bonds, be designated as bonded smelting warehouses. Ores of crude metals may be removed from the vessel or other vehicle in which imported, or from a bonded warehouse, into a bonded smelting warehouse, without the payment of duties thereon and there smelted or refined, or both, together with other ores or crude metals of home or foreign production: Provided, That the bonds shall be charged with the amount of duties payable upon such ores and crude metals at the time of their importation, and the several charges against such bonds may be canceled upon the exportation or delivery to a bonded manufacturing warehouse established under paragraph M of this section of an amount of the same kind of metal equal to the actual amount of dutiable metal producible from the smelting or refining, or both, of such ores or crude metals, as determined from time to time by the Secretary of the Treasury: Provided further, That the said metals so producible, or any portion thereof, may be withdrawn for domestic consumption or transferred to a bonded customs warehouse and withdrawn therefrom and the several charges against the bonds canceled upon the payment of the duties chargeable against an equivalent amount of ores or crude metals from which said metal would be producible in their condition as imported: Provided further, That on the arrival of the ores and crude metals at such establishments they shall be sampled and assayed according to commercial methods, under the supervision of the Government officers to be appointed by the Secretary of the Treasury and at the expense of the manufacturer: Provided further, That antimonial lead produced in said establishments may be withdrawn for consumption upon the payment of the duties chargeable against it as type metal under existing law and the charges against the bonds canceled in a similar sum: Provided further, That all labor performed and services rendered pursuant to this section shall be under the supervision of an officer of the customs, to be appointed by the Secretary of the Treasury, and at the expense of the manufacturer: Provided further, That all regulations for the carrying out of this section shall be prescribed by the Secretary of the Treasury.

The language stricken out is as follows:

That the works of manufacturers engaged in smelting or refining, or both, of ores and crude metals, may upon the giving of satisfactory bonds be designated as bonded smelting warehouses. Ores or crude metals may be removed from the vessel or other vehicle in which imported, or from a bonded warehouse, into a bonded smelting warehouse without the payment of duties thereon and there smelted or refined, or both, together with other ores or crude metals of home or foreign production: Provided, That the several charges against such bonds may be canceled upon the exportation or delivery to a bonded manufacturing warehouse, established under section M of this section, of the actual amount of metal produced from the smelting or refining, or both, of such ores or crude metals: And provided further, That said metal may be withdrawn for domestic consumption or transferred to a bonded customs warehouse and withdrawn therefrom upon the payment of the duties chargeable against it in that condition: Provided further, That all labor performed and services rendered pursuant to this section shall be under the supervision of an officer of the customs, to be appointed by the Secretary of the Treasury, and at the expense of the manufacturer: Provided further, That all regulations for the carrying out of this section shall be prescribed by the Secretary of the Treasury.

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Mineral Production of Great Britain in 1912

In our issue of May 11, 1913, the 1912 mineral production of Great Britain was reported as given in advance sheets, published by the British Home Office. The revised statistics have just been issued and are as follows, the figures including the production from mines under the Coal Mines Act and Metalliferous Mines Act, and also from quarries:

Arsenic, 2194 long tons; arsenical pyrites, 2450; barium compounds, 45,377; bauxite, 5790; chalk, 4,285,412; chert, flint, etc., 74,718; clays and shale, 12,808,950; coal, 260,416,338; copper ore and precipitate, 1933; diatomite, 62; fluorspar, 47,246; gold ore, 170; gravel and sand, 2,191,451; gypsum, 285,291; igneous rocks, 6,638,215; iron ore, 13,790,391; iron pyrites, 10,522; lead ore, 25,409; lignite, 62; limestone, 11,500,660; manganese ore, 4170; mica, 29,962; ochre, umber, etc., 13,947; oil shale, 3,184,826; rock salt, 218,055; salt from brine, 1,904,195; sandstone, 3,839,567; slate, 383,422; soapstone, 8; sulphate of strontia, 19,370; tin ore, dressed, 8166; uranium ore, 42; wolfram ore, 193; zinc ore, 17,704 tons.

PERSONALS

J. Parke Channing returned from Arizona on Sept. 8.

Dr. L. D. Ricketts is expected in New York this month.

Dr. William B. Phillips, of Texas, is visiting in New York.

J. R. Finlay intends to leave for the West next week on professional business.

George E. Winkler is examining property in the Portland Canal district, British Columbia, for Victoria men.

C. H. Macnutt left London on Aug. 29, to take charge of the Burma Mines, Ltd., in the Northern Shan States of Burma.

Richard Trimble, of New York, treasurer of the Steel Corporation, was in Duluth this week. He was making a lake trip.

Robert E. Cranston has returned from Colombia and is now in San Francisco. He expects to go back to Colombia before long.

John Ross, a well known mining engineer of Sutter Creek, Calif., is at Galice, Ore., in Josephine County, making an examination of the Almeda property for parties who are financing the mine.

Robert Nye has resigned as superintendent of the Golden Gate mine, Grass Valley, and H. H. Estee has been appointed to the position. Mr. Nye will now devote his whole time to the superintendence of the Idaho Maryland.

Homer L. Carr, accompanied by R. C. Grant, sailed from New York on the SS. "Santa Marta," last week, for Colombia to drill the Mapuri tract of the Colombia Gold Mines Corporation on the Nechi River, a few miles below Zaragoza.

George A. Laird, who has lately been manager of the Candelaria Mining Co., in Chihuahua, has received the appointment of general superintendent of mines of the Great Cobar, Ltd., and leaves San Francisco for Australia, on Sept. 17.

Dr. R. Beck, rector of the Freiberg Bergakademie has been in America, attending the International Geological Congress. On Tuesday evening last, the Old Freibergers in America had a dinner party in his honor at the Engineers Club, New York. About 20 were present.

Prof. H. M. Parks, director of the Oregon Bureau of Mines and Geology, accompanied by Prof. A. M. Swartley, a field worker in the Bureau, are in eastern Oregon, where they will identify and list the mineral resources of Baker, Grant and Wallowa counties for the Bureau.

A party of English capitalists, including Sir Augustus Fitzgeorge, a relative of King George V, and H. H. Van Custen, Richard Van Custen and Edward Van Custen, members of a syndicate which controls a group of Cobalt mines, have been making an investigation of the Cobalt camp.

Bancroft Gore has been appointed professor of metallurgy at the Montana State School of Mines, and will have charge of that department during the coming year. Mr. Gore was for many years a member of the engineering staff of the Washoe Reduction Works, and later was smeltery superintendent of the Gatico Copper Mining Co., in Chile, which position he held until his return to the United States last July.

OBITUARY

Herman Hegeler, who was a member of the zinc smelting firm of Hegeler Bros., the other member being his brother Julius, died suddenly last week at Chicago, Ill., while on his way home from the Yellowstone Park. He was 41 years of age. He was born at Lasalle, Ill., the son of the late Edward C. Hegeler, famous as the father of the American zinc-smelting business in America, and together with his brother he was trained in the works of the Matthiessen & Hegeler Zinc Co. About six years ago the two brothers launched out for themselves and built a plant at Danville, Ill., which they have operated continuously ever since. Herman Hegeler was a man of sterling qualities and was a metallurgist of ability and achievement, but his absorption in his business prevented him from being the contributor to professional literature that he would have liked to be.

SOCIETIES

Second Coöperative Safety Congress—The Second Cooperative Safety Congress, to be held under the auspices of the Association of Iron and Steel Electrical Engineers, will begin at the Hotel McAlpin, New York, on Sept. 22, and continue for three days thereafter.

Mining and Metallurgical Society—The New York Section will meet at the Chemists' Club, New York, on Tuesday, Sept. 16, at 8 p.m., the meeting being preceded by a dinner (informal) at 6.30 p.m. The meeting was first announced to be on Sept. 18, but the date has been changed.

American Mine Safety Association—The annual meeting of this association composed of leading coal and metal mine operators, mining engineers, mine-safety engineers, and mine surgeons will be held in Pittsburgh, Sept. 22-24. The association which held its first meeting a year ago has for its purpose a reduction of the number of accidents in the mines and quarries (3602 in the year 1911) and the alleviation of the more than 60,000 men who are injured each year. The program will include a mine-rescue and first-aid contest at Arsenal Park on Sept. 22; in the evening a reception to the members and motion-picture lecture on the mining industry. On the second day the opening session of the association will be held in the morning and a report of the executive committee will be made on the proposed constitution of the society. In the afternoon there will be an explosion in the experimental mine of the Bureau of Mines at Bruceton, Penn. On Sept. 24, the third day, there will be a business session at the hotel and an election of officers. In the afternoon members will visit the Experiment Station of the Bureau of Mines at Pittsburgh.

Geological Convention, National Conservation Exposition—A meeting of geologists, mining engineers and others interested in the development and conservation of the mineral resources of the country, will be held in Knoxville, Tenn., under the auspices of the National Conservation Exposition, Sept. 19, 1913. This meeting will occur in conjunction with the Miners' Field Day, which is to occur on Sept. 20. A partial list of the papers is: The State Geologist and Conservation, Dr. A. H. Purdue, State Geologist of Tennessee; Economic Non-Metallic Minerals of the Southern States, Dr. J. Hyde Pratt, State Geologist of North Carolina; Sane Development of the South's Mineral Resources, E. J. Watson, Commissioner of Agriculture, Commerce and Industries, South Carolina. On the day following (Sept. 20), will occur the Miners' Field Day. The exercises to be given on this occasion include demonstrations of explosions of coal dust and life-saving methods by the United State Bureau of Mines and contests between teams representing various coal mines in the Appalachian region, showing methods of life saving, etc. A large number of teams from all parts of the Appalachian field have entered for these contests for which valuable prizes have been contributed.

NEW PATENTS

CONCENTRATOR. William P. Ogden, Denver, Colo. (U S. No. 1,071,456; Aug. 26, 1913.)

DRILL—Hammer Drill. Andrew J. Carter, Victor, Colo. (U. S. No. 1, 069,853; Aug. 12, 1913.)

SIZING—Hydraulic Sizing-screen. Frank E. Steffy, Great Falls, Mont. (U. S. No. 1,070,552; Aug. 19, 1913.)

HOISTING CABLE—Flat Hoisting Cable. Désiré Baudewyns, Montignies-sur-Sambre, Belgium. (U. S. No. 1,070,661; Aug. 19, 1913.)

CONCENTRATION—Method for Concentration of Ores. Orr Johnson Adams, Grand Junction, Colo. (U. S. No. 1,070,313; Aug. 12, 1913.)

TIN—Improved Cold Electrolytic Process for the Recovery of Tin from Waste Tinned Metal and Alloys. A. L. C. Nodon, Bordeaux, France. (Brit. No. 24,203 of 1912.)

DRILL CHUCK—Water-feed Drill Chuck. Russell S. Carter, Hewlett, N. Y., assignor to Ingersoll-Rand Co., Jersey City, N. J. (U. S. No. 1,071,203; Aug. 26, 1913.)

ALLOY OF ALUMINUM, NICKEL AND MAGNESIUM. Arthur Lyell Brooke and Robert Dunbar Mackintosh, Mortlake, England. (U. S. No. 1,070,007; Aug. 12, 1913.)

BLAST FURNACES—Mechanical Feeding Apparatus for Shaft Blast Furnaces. Frederick Seaborne Sanderson, Melbourne, Victoria, Australia, assignor to The Mount Lyell Mining & Railway Co., Ltd., Melbourne, Australia. (U. S. No. 1,070,922; Aug. 19, 1913.)

EDITORIAL CORRESPONDENCE

SAN FRANCISCO—Sept. 4

The California State Mining Bureau fourteenth general report is in preparation. Five assistants are in the field gathering data. The general reports were discontinued with the issuance of the thirteenth in 1896. An effort was made to resume the publication in 1900; the data were obtained, but the report was not printed. These reports contain the names of all mines operating and idle, alphabetically arranged, in counties and a brief history or description of the life and operation of the property. Mr. Hamilton, state mineralogist, proposes an innovation. The result of the work of the field men will be issued in advance bulletins as each county is completed. These county bulletins will be of the same form as the general report; and when the work in all the counties is completed the several bulletins will be combined in the general report. While the large operating mines will not be ignored, the purpose of the report will be rather to assist prospective investors and prospectors than to exploit the accomplishments of the established mines. The field assistants are all men of technical education and training who have had experience in California fields. The chief purpose of the state mineralogist is at present to gather the data for the general report as expeditiously as possible. There are two other publications, however, to be issued as soon as the data can be prepared, that will not be controlled by or interfere with the field work. A compilation of the California mining laws is in preparation and will be issued as soon as completed. There has been a constant demand for such publication since the legislature adjourned. A number of new laws were enacted, some directly and other indirectly affecting the mining industry, and naturally the men interested in mining look to the State Mining Bureau for information respecting the laws governing or affecting the industry. There is also in preparation by the bureau a complete and comprehensive index to the determinations made by Edward B. Preston, the determinative chemist. There is an alphabetical index to these determinations, but it does not conform to the present-day practice of preserving records. The interior arrangement of the bureau has recently been improved. The library space has been enlarged. The offices of the state mineralogist, the secretary and the librarian have been enlarged and directly connected. The statistician and curator now have a combined office. The chemical laboratory has been rearranged and new equipment added. For the first time in several years the State Mining Bureau has an appropriation commensurate with its requirements.

DENVER—Sept. 6

Steps to Reopen Creede Mines are being taken by united action of the several companies and it is not unlikely that the plan will be consummated.

Pretty Good Business is Reported by the Denver mining supply houses, but things are rather dull with most of the machinery manufacturers. The Denver Engineering Works Co. is doing some interesting things with the Richards jig. The new Plumb pneumatic jig is also attracting attention.

Opinions Respecting Eagle and Platoro are diverse. The geological conditions at Eagle do not appear to be favorable; yet the fact remains that considerable ore of high grade has already been shipped. The Mammoth mine, at Platoro, seems to have a fairly large tonnage of low-grade ore. Several hundred prospectors are at work in that district.

Leadville's Production does not now include much of anything besides zinc ore. A large tonnage of that ore is, however, being shipped steadily, and producers are helped by the advance in the price for spelter. The zinc-ore miners are especially exercised by the new taxation requirements. The value of the gross output when figured on spelter content at New York price and on ore prices are two very different things. There may be some litigation respecting the interpretation of the law in these cases.

A Display of Gilpin County Ores was made prior to the Knights Templar conclave, which brought, it is estimated, 100,000 visitors to Denver. A fund was raised by Gilpin County, Central City, and Black Hawk, and a magnificent display of the gold-bearing ores was made in a building opposite the Brown Palace Hotel. What seemed to attract most attention, however, was the display of the radium-bearing pitchblende from the German mine, and one or two other properties, near Leavenworth Gulch. This pitchblende is said to be the richest in radium. It is said that Eastern men have secured control of the pitchblende-producing mines in Gilpin County, the investment being made for the John Hopkins University, at Baltimore.

BUTTE—Sept. 3

The Butte, Wisdom & Pacific R.R.'s chief engineer has a crew of 16 engineers in the field and has completed the preliminary survey of the line between Divide, the initial point, and Dewey's Flat, a distance of six miles. A maximum grade of 0.9% has been established. At the place where the road passes the Butte Power company's dam, about four miles above Divide, it will be necessary to cut three tunnels, but this will be the only work of the kind that will have to be done on the entire length of the line between Divide and Wisdom. The first construction will be from Divide to Elkhorn, a distance of 24 miles, and the management expects to begin grading operations this autumn.

An Electric Railway Line between Red Lodge and the Washoe and Bear Creek coal fields has been advocated by business men and property owners of Red Lodge for some time. A preliminary survey of the proposed route between Red Lodge and Washoe, a distance of 5½ miles, places the cost of grading, installation and equipment, at $50,000, and a mass meeting was held in Red Lodge, Aug. 26, during which local men subscribed $16,000 toward this amount. For the purpose of organizing a campaign to complete the stock subscription canvass, State Senator O'Shea, president of the Red Lodge Commercial Club, appointed a committee of five prominent business men. The object of the line will be to afford transportation facilities in order to open up rich agricultural land in the western half of Carbon County known as the Rosebud district, and with its completion the committee will turn its attention to the development of this land project, with the purpose of making Red Lodge the center of an interurban system.

DULUTH—Sept. 6

The Extension of the Cuyuna Deposits is thought by some prominent Duluth mining men, among them members of the Locker-Donahue syndicate, which is prominent on the Cuyuna range, to exist in western St. Louis County, and they have tied up 4000 acres under options to purchase. The land is in 50-19, 50-20 and 50-21, on the extreme western side of the county, and adjoining Aitkin County on the east. It is virgin territory, though some good ore has been located nine miles to the west, in Aitkin County. The new territory has the magnetic phenomena of the Cuyuna, and the general physical characteristics of the Mesabi range. Float ore of high grade is found in the glacial drift. Whether or not this is a new range, or an extension of the Cuyuna, is something that the Cuyuna-Extension Iron Co. will undertake to demonstrate. One drill has been installed, at Prairie Lake, and other drills will be put in operation this month.

CALUMET—Sept. 8

President Moyer, of the Western Federation of Miners, spent a few days, during the last week, in the strike zone. He visited Lansing with Clarence S. Darrow, formerly attorney for the Federation and had a conference with Governor Ferris in regard to settling the point at issue in the strike by arbitration, eliminating the question of recognition of the Western Federation of Miners. They called upon Mr. Ries, chief counsel for the Calumet & Hecla and subsidiary companies. Disturbances have been general throughout the district during the week. Several nonunion men were attacked by the union pickets, both men and women, and some of them were severely beaten. At the Kearsarge mine, a mob of strikers, numbering several hundred, attacked a party of deputies who were escorting some of the foremen to the property the morning of Aug. 30. A fight ensued in which several shots were fired and after the mêlée, it was found that a 15-year-old Hungarian girl had been wounded, so that there was little hope of her recovery. At Centennial Heights, near the Calumet & Hecla property, the disturbances have been so frequent that troops are on duty constantly and the place is practically under martial law. Incidentally, this is the location from which the Federation secured several

affidavits early in the strike, protesting that the troops were not necessary and that the community was peaceful. More men returned to work underground at the Calumet & Hecla and another shaft resumed operation during the week with a resulting increase in rock shipments to the mill. Nothing has been done toward attempting the opening of any of the mines north of Calumet. The Federation has given some of the members in destitute circumstances, orders for provisions, but no general distribution of strike benefits has been made.

A powerful searchlight has been erected on the Calumet & Hecla property to assist the guards in case any outbreaks are made in the night.

JOPLIN—Sept. 6

Suits Against J. M. Short were filed last week in the circuit court for October trial. Short has developed a long list of profitable mining properties during the last three years. Edward Elliott sues him for $125,000, alleging that he had been a partner of Short and had assisted in prospecting the Sitting Bull lease. He demands a one-fourth interest. The other suit against Short and associates alleges that they failed to complete the organiztaion of the Black Hawk Mining Co. to take over a Thoms Station prospect according to a contract and damages to the extent of $30,000 are asked. Both suits will be tried in October.

A Result of Better Ore Prices is that the American Zinc, Lead & Smelting Co. has announced the starting up of two more of its Prosperity mills and the early erection of a plant in the north Webb City field. This new activity comes after a considerable period of idleness by some of this company's mills. The starting of these mines and mills places a large number of idle men at work again. Balancing these revivals of operations to a certain extent several of the district's large mills have been destroyed by fire during the last fortnight. The Athletic mill, one of the largest operating plants in the entire district, was burned to the ground while the Waneta, west of Joplin, was similarily destroyed. The recent dry weather is responsible for the facility with which fires may be started and the lack of fire protection makes destruction almost certain once a fire starts. There have been a large number of prairie fires in the last week, some of which narrowly missed setting fire to some plants northwest of Joplin. As no rain has fallen since May, all vegetation is dead and dry and passing trains set the grass and weeds afire almost daily.

PLATTEVILLE, WIS.—Sept. 7

Mining Is Progressing Steadily with a fair production of zinc ore, and larger deposits are being shown up. Electrical power is rapidly taking the place of steam, and is supplied by two companies, the Interstate Light & Power, of Galena, Ill., and the Mineral Point Service Co., of Mineral Point, Wis.; three-phase current is commonly used. During the last season many new leases were acquired by the different mining companies of the district. Much drilling has been done in the last two years and in many cases with good results. As high as 216 churn-drill holes have been put down in one section. The Peaceful Valley Zinc Co. has two drills at work on the Peaceful Valley property near Elmo. Bock, Meyers & Brown Co., of Lancaster, are making arrangements for building a mill on their Bidick property near Livingston. Drifting from their recently sunk shaft shows a good grade of milling ore. This company will also start to unwater the Squirrel mine, near Mifflin as soon as repair work is completed on surface equipment. The Mineral Point Zinc Co., operating the large zinc smelting plant at Mineral Point, is operating two of the largest and oldest mines in the district, the Coker mine, near Livingston, and the Kennedy mine, near Hazel Green. The Coker mine has been operated almost continuously for 45 years and still looks as good as ever. This company owns the Sunrise lease adjoining the Coker mine. Here shaft sinking has been completed and the building of a 250-ton mill will be started soon. The company recently acquired the Black Jack mine, near Galena, Ill., where much water is being contended with and two 20-in. lift pumps, and two centrifugal pumps are being installed. Tailing is being milled at the Board of Trade mine, near Cuba City.

WOODROW WILSON CREEK, ALASKA—Aug. 20

The Placer Diggings between Woodrow Wilson and Johnson Creeks tributary to the Shushanna River and known as Shushanna Camp, continue to promise to equal Dawson and Fairbanks. The gravel deposit is 15 miles long by seven wide, all workable ground and staked. Newcomers are staking the mountain top and the quicksand of the Shushanna river. Pay has been found in six creeks and colors have been found on the surface in benches. The shallow diggings are very rich. William E. James, the discoverer, has taken out $27,000 from his claim at the mouth of the Little Eldorado, but lack of water prevents regular work. The smallest cleanup on this claim with five men shoveling two days was $1450. The largest was $3100 in one and one-half days. Carl Whitham, is digging a channel for water alongside the pay streak on Claim Two, and is getting $50 per day from the gravel with one man shoveling. Five men shoveling on Andy Taylors fraction on Bonanza are taking out $100 per day per man; some of the nuggets are worth as much as $40. Sluicing of the surface gravel on the Big Eldorado is yielding pay. Work on the shallow claims is being held up owing to lack of lumber. Five hundred men are here with supplies to last until winter traffic opens. Over 2000 have been at the diggings and of these fully 1500 have been forced to leave owing to lack of food. The men who are here for the winter are building cabins in the timber on Woodrow Wilson Creek. Many have hurried their recording work on claims in order to get out before winter. Claims staked by men who could not stay to do the work lapse in 90 days. Late comers make lists of all claims and watch a chance to stake. Stampeders who came overland from Dawson and Fairbanks were 20 days on the trail. Many lost their packs in the rivers. It is rough from McCarthy over the Scolai Pass and the Russel glacier trail has proved much the best. This trail will soon be closed. A new trail is being surveyed from McCarthy up the Nazina River to the glacier and over the Shushanna glacier. This trail will be ready within two weeks. The new route is only eight miles long and will be used in winter. Wagons may be used to the foot of Nazina glacier and horses and sleds from there over the ice to within 15 miles of the camp. The government is being severely criticized for doing no work on the trails, and for negligence in not advising the many hundreds going to the diggings as to the best routes. No attempt has been made to police the region although many weeks have elapsed since the discovery and it is generally known that many "cheechacos" have gone in with insufficient supplies, and that the hardships that must surely follow will result in much suffering and probably in some loss of life. Commissioner H. E. Morgan of the White River district, is unable to handle the rush of recording work. Deputy Healy filled up the record book and then quit his job. Morgan is now keeping the records in bundles and has asked to be relieved. He wants to work his claim which from slight prospecting appears to be very rich. Mining operators with money to buy ground are arriving from all directions. Many choice claims have been secured by Fletcher Hamshaw, for eastern men. Hamshaw's outfit, with 14 men, was at the North Fork island on the White River, 28 miles away, when the strike was made. They were prospecting copper property. The party staked about 40 claims, all of which were recorded and later transferred to Hamshaw. The James claims, 15 in number, are owned in partnership by James and his wife and N. P. Nelson, who were with him when the discovery was made, and William E. Johnson, a Dawson man who grubstaked the outfit. Johnson has just arrived with a pack train of supplies. Owing to the scarcity of supplies little prospecting has been done far from the immediate place of the discovery. Many miners came in with just enough provisions to last them to the Shushanna, for a stay of a few days and for the return trip. Many of these have gone out for more supplies and when they return for the winter it is expected that the full area covered by the rich placer will be known. It is believed from hasty work that the area will extend into the Canadian territory.

AGUJITA, COAHUILA—Aug. 25

Destruction of the Lampacitos Coal Plant of the Cia Carbonifera Agujita y Anexas, S. A., was effected Aug. 16, by the defeated Carranza forces in retreating northward from Hermanos, where they were badly defeated by the Federals. The destruction was premeditated, and as soon as word from Hermanos came that the fight there had been lost, the destruction commenced. The Carranza soldiers used dynamite and gasoline, and within two hours they had created a loss of fully $1,000,000. The washer was completely destroyed, as was the warehouse with $40,000 worth of supplies. In the power plant the 200-, 150-, 100- and 30-kw. generating units were first blown to pieces with dynamite, and then the building was burned. At the mines the tipples were burned, and the fans and fan houses, which were fireproof, were destroyed with dynamite, and the houses burned. A large number of employees' houses and miners' houses were also burned. The home of the manager was also destroyed with all conents. The mines are filled with water, which is also a great loss. The plant at Agujita has been threatened with similar disaster unless $50,000 is paid for "protection." This cannot be done. The rebels have already taken from there all supplies, furniture, etc., and it is feared that the property may be destroyed at any moment.

THE MINING NEWS

ALASKA

ALASKA UNITED (Douglas)—In the Ready Bullion mill 18,200 tons of ore were crushed in July from which gold and concentrate worth $43,942 were recovered, or $2.41 per ton; $14,413 being estimated as net profit. In the 700 Ft. Claim mill 18,480 tons of ore yielded $2.60 per ton or a total of $47,522; $19,271 being estimated as net profit.

ARIZONA

Gila County

OLD DOMINION (Globe)—Steel erection work on the new crusher plant, sampling mill and conveyors is rapidly nearing completion. Crushing machinery and transmission equipment is now being installed in the buildings. While the change from cage to skip hoisting is being made at the "A" shaft ore will be hoisted at the Kingdon shaft and sent around by rail to the old crushing plant. Additional custom ore-bins were built at the "A" shaft in August, almost trebling the capacity for custom ores. As soon as the steel workers have completed the crushing plant and sampling mill, erection work on the concentrator will be commenced. In August one of the three Chile mills and several tables and vanners were removed from the old concentrator to make room for new foundations. This has decreased the capacity of the old unit somewhat. The concrete work which remains to be done in connection with the new concentrator consists of completing the tailing and concentrate tunnels, the concentrate bins and slime tanks and part of the Hardinge mill foundations. A 100,000-cu.ft. fan has been installed at the "B" shaft for ventilating the west end of the mine, and the ventilation underground is already greatly improved. The sinking of the Grey shaft to the 1200 level of the Old Dominion continues to make good progress and should be completed early in October. Four furnaces are in operation at the smelting works.

Greenlee County

ARIZONA COPPER CO. (Clifton)—The new smelting works two miles south of Clifton was scheduled to be blown in Aug. 27. A notable feature of the new plant is the extensive application of electrically operated labor saving devices.

Maricopa County

VULTURE (Wickenburg)—Two motor trucks are hauling concentrates to Wickenburg. Several carloads of concentrates are shipped each month.

Pima County

CALUMET & ARIZONA (Warren)—This company is reported to be making the final payments on the New Cornelia mine in the Ajo mountains. Four of the reverberatories at the new smelting works at Douglas were fired up Sept. 2. The starting of this plant will enable this and the Shattuck Arizona to increase production.

Santa Cruz County

R. R. R. (Patagonia)—About 25 men are now being employed at this mine, not 8 men, as stated in these columns in the issue of Aug. 23. Within the last 18 months, as many as 150 men have been employed at one time and within that time more than $400,000 worth of high-grade copper ore has been mined and shipped. There are now in the mine more than 50,000 tons of low-grade ore that will assay between 3% and 4% copper. Nearly all the high-grade ore that was in sight has been mined; it extended from the 50- to the 400-ft. level. A payment is due Nov. 1; N. L. Amster is the buyer. The owners are R. R. Richardson, and A. E. Crepin; they have received more than $100,000 in royalties in payment so far.

Yavapai County

UNITED VERDE (Jerome)—The new, steel, change house is nearly ready for use. The site is at the mouth of the 50-ft. adit which is soon to become the main entrance for all workmen.

BLUE RIDGE (Wickenburg) — The 40-ton concentrator and leaching plant on the Hassayampa River near Constellation has been put in commission. The company owns a process which is expected to treat the carbonate ores successfully.

ARKANSAS & ARIZONA (Jerome)—A new hoist is being installed at the main shaft. Drifting is in progress on the 1300- and 1400-ft. levels and a raise is being made from the 1400-ft. level to the shaft. When this is completed the shaft will be sunk to a depth of 1800 feet.

Y.-P (Senator)—The first carload of ore was recently shipped to the El Paso smelters. The ore came from the 600-ft. level of the old Cash mine. This level is reached through a long drift from the Senator tunnel. The mill is running night and day treating the ores on the old dumps. The old workings have been unwatered to the 200-ft. level and as soon as the 300-ft. level is reached work will be resumed there.

WAKOTA DEVELOPMENT CO. (Congress)—This company is a reorganization of the Coronada Gold Mining Co. A 5-stamp mill is being built on the Grasshopper property which has in sight, according to statements of the manager, $60,000 worth of ore, exposed by very little development work. The ore assays $100 per ton and better. Work is also being continued on the old Coronada property. A diversion ditch from Sand Creek to the reservoir to supply the Grasshopper and Coronada properties and the company's ranch, has just been completed.

CALIFORNIA

Amador County

DEFENDER (Defender)—The mine is idle temporarily for lack of water for milling.

BUNKER HILL—(Amador City)—Dividend No. 86, of 2½c. per share, was declared Aug. 15. Cutting a station at the 2150-ft. level in the main shaft is in progress. Deepening the shaft to 2350 ft. will be resumed upon the return of the electric motor, which is being repaired.

KENNEDY EXTENSION GOLD MINING CO. (Jackson)—John A. Gibson, mine foreman, brought suit for $30,000 for personal injuries received Feb. 3, 1913, while riding a skip in the 1000-ft. shaft. The hoisting engine was suddenly started at high speed, the skip jumped the rails and Gibson jumped from the skip to avoid being crushed. He was caught between the skip and the timbers. His face was badly mutilated. The case is on trial.

Calaveras County

CARPENTER (Mokelumne Hill)—The mill is completed, the electric hoist is installed and the pumping plant for furnishing water is ready for operation. The several drifts are reported to be in pay gravel.

INGOMAR (Campo Seco)—Development has been resumed, and it is reported that copper-bearing ore has been disclosed. The mine was opened as a gold mine, and should produce both gold and copper in commercial quantity. It is in the region of the Penn copper mine and in the same formation that is found in the West belt of the Mother Lode.

STANDARD AMALGAMATED EXPLORATION CO. (Esmeralda)—The wiring for the electric-light plant at the Economic mine is completed. This plant will furnish lights for the 20-stamp mill, the assay office and other buildings. The power line is nearing completion. It is reported that enough ore has been blocked out to supply the mill for more than one year.

CALAVERAS COPPER CO. (Copperopolis)—G. D. Fontana and Newton Rutherford, representing the company, have returned from Boston, where they went to confer with the Ames people, who control the title to the copper property, for the protection of California creditors. They report satisfactory results. Besides the claims of these creditors there was a sum due the miners, which has since been paid. The mine is shipping ore sufficient to pay current expenses, and the entire indebtedness of $30,000, it is now understood, will be settled without further disturbance of the operation of the property. Improvements and repairs to the smelting plant have been made within the last year, including a plant for desulphurizing the ore.

Inyo County

IN THE PANAMINT DISTRICT options have been secured by San Diego men on some of the old mines. It is reported that development will be carried on through a new tunnel.

SKIDOO MINES CO. (Skidoo)—It was expected that the new 10-stamp mill which is to take the place of the 15-stamp mill destroyed some time ago by fire, would be completed and that the stamps would be dropping by Aug. 15, but delay in the delivery of material prevented. Much of the old material is being used, but a great deal of new material is necessary to improve the mill and make it modern.

SALINE VALLEY SALT CO. (Bishop)—Two carloads of salt were shipped from the plant at Swansea to Laws, July 27. Smaller lots have been shipped, but this was the first carload shipment. The tramway is reported as working satisfactorily. The full complement of buckets is in operation, but carrying only half loads. The two-story warehouse, 30x80 ft., at Swansea, has been finished. The grinding machinery with a daily capacity of 100 tons is on the ground and will be installed immediately.

Nevada County

GOLDEN CENTER (Grass Valley)—The recent discovery of gold in an excavation begun under a garage for the setting of a gasoline tank has induced the owner of the garage to deepen the excavation and sink a shaft to a depth of 100 ft. The mineral rights below a depth of 100 ft. are owned by the Golden Center company, but A. B. Snyder, owner of the garage, believes he can profitably mine the first 100 ft. of depth.

Placer County

WICKHAM (Rawhide)—Curtice Bros., of Stockton, will develop this mine with a small mill that is on the ground.

BELLEVUE-BULLION (Ophir)—A stamp mill will be built for crushing ores from this mine, and from the Grass Ravine group. The ore is now being treated at the Big Bursar mill. The water in the shaft of the Grass Ravine is being pumped preparatory to retimbering and deepening the shaft.

Shasta County

MIDAS (Harrison Gulch)—The 100-ton cyanide plant is being built. The equipment will include a tube mill and Merrill filter press.

NOBLE ELECTRIC STEEL CO. (Heroult)—The smelting plant was temporarily closed down in July while awaiting the shipment of electrodes from the East. Tests have been recently made to determine the economic value of coke as compared with charcoal.

COLORADO

Clear Creek County

LUCANIA—The properties on Fall River will be sold under foreclosure Sept. 16, 1913, to satisfy judgments amounting to $50,000.

SMUGGLER (Silver Plume)—This property, owned and operated by the Hollingsworth Mining Co., will be more thoroughly developed in depth. The company plans to sink the shaft an additional 200 ft. and drive east and west on the vein.

NORTH AMERICAN SMELTER & MINES CO. (Jefferson)—This company is to be reorganized. The property in Clear Creek and Gilpin Counties was recently bid in at sheriff's sale for $215,000, and includes the copper-smelting plant on Clear Creek below Golden. The new organization proposes the erection of a 300-ton concentration and cyanide mill, near Golden, designed to treat $4 ore. If the mines of the company and outside properties can assure an ore supply equivalent to 300 tons per day, the new organization is prepared to raise $500,000 for the construction of the proposed mill, the remodeling of the smelter and the purchase of custom ores.

HOOSAC TUNNEL & MINING CO. (Idaho Springs)—To satisfy a judgment obtained in the district court at Denver in favor of George E. Armstrong, trustee for the mortgagees and noteholders, in the sum of $78,810 all of the property of this company has been sold by Sheriff A. E. Straub for $40,000. The purchaser was Samuel T. Worley, representative of the trustee. The property is two miles above Idaho Springs, near the mouth of Fall River. The 100-ton mill, that was completed less than four months ago, will at once be put into commision. Development first will be centered on a 15-ft. vein intersected 2500 ft. from the portal of the crosscut tunnel.

San Juan Region

GOLD HAS BEEN DISCOVERED IN LIME CREEK, recently, by a Mexican sheep herder, and his employer, A. M. Hubbard has brought in a sack of some of the richest ore seen in this region for many years. The strike was made 10 miles southwest of Silverton.

BUTTERFLY-TERRIBLE (Ames)—This property is being successfully developed and operated by lessees, who are employing a large force of men. The 30-stamp mill is in steady operation. An air-compressor plant has recently been purchased and is being installed.

LITCHFIELD—A small force of men is employed on development at this Mount Wilson property. The first-level drift has been advanced 140 ft., and the second level 275 ft. on the vein. The ore is reported to assay $35 per ton in gold, silver and lead. The mine is six miles from Snow Spur, the nearest shipping point on the Rio Grande Southern R.R. Excavations are being made at the mine for new buildings, which the management plans to erect this season.

JUNTA (Telluride)—About 45 men are employed in building the milling plant in Bear Creek Gulch, and the work is progressing rapidly. The erection of the mill building is under way and some of the machinery is being installed. The tank houses are completed. A small force of men is employed at the Jim Crow mine on Ballard Mountain, and the Wasatch mine in La Junta Basin, placing these properties in readiness for active operation by the time the mill is completed.

IDAHO

Cœur d'Alene District

GUELPH—Developments have exposed some good carbonate ore in a heretofore undeveloped vein.

EMPIRE (Mackay)—The crosscut from the face of the 1200-ft. tunnel at this property on Big Creek has encountered some good milling lead ore at a depth 1000 ft.

TERRIBLE EDITH (Murray)—The first shipment consisting of 100 tons of lead and 50 tons of zinc ore has just been made. It is thought that shipments can be made monthly in the future.

BRETT (Prichard)—A strike of rich copper ore was made recently at this property 20 miles from Prichard. The ore was encountered in the 100-ft. tunnel at a depth of 200 ft. Little development on the ore has been done but enough to insure a shipment of several carloads of ore. The ore is said to average about $145 per ton.

CEDAR CREEK (Murray)—The work preparatory to driving the new 4500-ft. tunnel from the creek level is nearing completion. The new compressor is being installed and the flume for water to supply power has been finished. New buildings have been built and the timber for the tunnel is on hand. The upper workings were destroyed by a snowslide last winter but the present location will prevent a repetition of such a disaster.

NATIONAL COPPER MINING CO. (Wallace)—The 500-ton mill now being built by contract by the General Engineering Co. of Salt Lake City, will be so constructed that it can readily be enlarged to a daily capacity of 1500 tons. The ore will be transported from mine to mill by an electric trolley, the distance being two miles on a 4% grade. Machine shop, compressor building, blacksmith shop, boarding and bunk houses and two water-driven electric plants are also being built. The treatment of the ore will consist of a combination of gravity and flotation systems.

MARSH MINING CO. (Burke)—This company has purchased control of the Poorman Extension Mining Co., one of the pioneer corporations of the Cœur d'Alenes, its charter having been issued in 1886. The holdings purchased consist of the Green Mountain, Fuller, Burke, Clark Fraction and Fir Fraction, all of which adjoin the original Marsh group on the north and the Poorman property on the east. The five claims include approximately 45 acres which, together with the Got-Em-Now claim, recently purchased from Patrick Clark of Spokane, gives the Marsh company control of 130 acres, patented, including a part of the town of Burke, lying on both sides of Cañon Creek. The portal of the Marsh main working tunnel is on the Green Mountain claim, an easement for the bore having been secured several years ago, and the purchase of the Poorman Extension ground gives the Marsh surface rights much needed in operation.

MINNESOTA

Cuyuna Range

DULUTH-BRAINERD MINING CO. (Iron Mountain)—The surface plant has been completed, and shaft sinking is progressing at a fair speed.

PENNINGTON MINING CO. (Crosby)—This operation, at present the only open pit on the Cuyuna, is averaging about 60 cars of ore per day. Only one shovel is now working in ore. Recently, in 10 hr., one shovel loaded 240 20-yd. dump cars, exceeding all previous records either on the Cuyuna or Mesabi ranges.

CUYUNA-DULUTH IRON CO. (Ironton)—At the recent annual stockholders' meeting at Duluth, a shaft was authorized for the Federal property adjoining the town of Cuyuna. Work will be started within 60 days. The Northern Pacific Ry. will secure the traffic. The company now has a shaft in the village of Ironton.

PITTSBURGH STEEL ORE CO. (Riverton)—The company is about to install one or more steam shovels at its open pit, to carry forward the stripping operations during the winter months, when the hydraulicking will be handicapped by low temperatures. The company has also purchased locomotives. No shipments will be made this season.

Mesabi Range

NEW DANGER SIGNALS are to be adopted in the iron mines of Minnesota and Michigan. The district engineer for the Bureau of Mines, for the Lake Superior district, announces that the Government is about to adopt a new code of danger signals in which word signs are to be discarded because of illiteracy and different nationalities among the miners, heretofore necessitating printing the signs in several languages. Under the new system, green arrows will point to safety and black arrows will indicate danger. The background of the signs will be white, and the arrows will be painted over a red oval in the center.

GREAT NORTHERN RY. (Superior, Wis.)—It has been announced that the old ore dock No. 3 at Allouez Bay will be replaced next season with a modern steel structure. The present dock is of wooden construction. It is planned to have the new dock somewhat higher, to permit of greater drop into the vessel, thereby lessening the time required for loading.

MISSOURI

Joplin District

LACKAWANA (Galena, Kan.)—The concentrator is being repaired preparatory to handling a large quantity of ore. A large body of ore was encountered when blasting to remove a rock ledge that interfered with operations.

CHERRY TREE (Bellville)—This mine, worked several years ago but abandoned, has been cleaned out by a Joplin company. It is believed that the former operators failed to thoroughly develop an orebody which they worked. Some zinc ore has been taken out.

THANSKSGIVING (Duenweg)—This mine was closed down recently on account of difficulty in holding the water. Other properties in the vicinity having closed some time ago, the Thanksgiving faced trouble in keeping the mine drained and it was decided to cease operations until the others resume work. The Thanksgiving has been one of the big producers.

BANKERS LAND (Joplin)—A company, composed of Charles Wells, Franklin Smith and Charles Robinson, has made a rich strike with a drill, first discovering ore and continuing through mineral-bearing dirt to a depth of 102 ft. Other drill holes are to be put down. The lease, consisting of 28 acres, is a short distance from the Dexter mine, where a concentrator is being erected.

AMERICAN DAVEY (Carterville)—Mill No. 4 resumed operations recently after a long shut down, due to the decrease in zinc ore prices. The company will also start No. 2 mill. The mines are in the sheet-ground district, where low prices are more seriously felt than in any portion of the district. Three hundred men will be employed when the two mills have been placed in operation.

BIG IRISH (Thoms Station)—Frank Danglade and associates are operating this mine on a 20-acre lease of the Rusk land, having been successful in developing a zinc ore vein at the 140-ft. level. A 15-ft. face of ore is found there, while a 16-ft. face is said to have been found at a lower level. A new shaft has been sunk southeast of the mill shaft and ore from it will be conveyed to the mill by tramway, operations at the two shafts being expected to supply sufficient ore to keep the mill operating constantly.

St. Francois County

DWIGHT A. JONES AND ROBERT HOLMES state that all controversies between Holmes and the administrations of the St. Joseph Lead Co., and the Doe Run Lead Co., have been pleasantly and satisfactorily settled and all suits brought by Holmes have been dismissed.

POTOSI MINES CO.—Some of the stockholders have asked for an investigation of the affairs of the company, alleging that the directors, at a meeting held July 2, 1912, voted to convey all of the property of the Potosi Mines Co. and the Potosi Lead, Baryta & Mercantile Co. to the St. Francois Lead Co. for $50,000 in cash and 17,500 shares of its capital stock. The property thus conveyed, the plaintiffs claim, had an actual value of $750,000, and as a result of a syndicate agreement the plaintiffs allege that the defendants made large secret profits. The plaintiffs ask that the conveyance be declared fraudulent and without adequate consideration; that the defendants be required to convey back all the property to the Potosi Mines Co., and to refund all profits and property obtained by them in consequence of the alleged conspiracy; that a receiver be appointed to take possession of 15,130 shares of the St. Francois Lead Co., now held in trust by Charles I. Norris, and Denman Blanchard; and that Norris and Blanchard be enjoined from disposing of, transferring or encumbering the stock. The plaintiffs say that the Potosi Lead, Baryta & Mercantile Co. developed zinc mines estimated to be worth between $2,000,000 and $3,000,000 and that the principal asset of the Potosi Mines Co. is stock in the Potosi Lead, Baryta & Mercantile Co.

MONTANA

Butte District

OPHIR (Butte)—A few months ago, the mine and mill were closed down because of lack of capital to continue operations. The men still remain unpaid. A number of these recently held a meeting with the purpose of formulating plans for protecting their interests, and securing the wages due them. It was decided before taking any definite steps to await news from the East regarding proceedings being brought to put the company into bankruptcy. The claimants have expressed a determination to employ an attorney to collect the amounts due.

EAST BUTTE (Butte)—The management has announced its intention of reopening No. 1 shaft, which was closed about six years ago prior to the acquisition by the company of the Pittsmont properties, one-half mile east. A new electric hoist will be installed. The company plans to have the improvements to the reduction plant completed by the end of the year. This work to consist of rebuilding the concentrator, and doubling the blast-furnace capacity, which will make possible the treatment of about 600 tons of ore daily in addition to the present amount. Trouble with the miner's union has been settled by the company agreeing to discharge non-union carpenters.

TUOLUMNE (Butte)—A statement of operations from Jan. 1 to July 31, 1913, has been issued, showing that operations have been conducted at a loss. A total of 22,395 tons of ore were mined and treated, yielding 1,310,569 lb. of copper, 46,857 oz. of silver, and 91 oz. of gold, with a total valuation of $133,819, after deducting freight and smelting charges. There was a balance carried over from Dec. 31, 1912, of $202,762, which, added to receipts from ore mined, interest on deposit, etc., totaled $338,498. The disbursements, including $160,000, the amount of dividends, Nos. 4 and 5, together with mining, development, and running expenses, amounted to $301,917. A balance of $36,581 is shown on the books, of which $34,509 is cash and $2072.40 accounts receivable. The company is at present shipping 100 tons of ore daily, and is just about paying expenses. Development work on the 1800-, 2000- and 2200-ft. level has shown up practically no ore of a shipping grade, and the company is planning to sink the shaft to greater depth, possibly to the 2800-ft. level.

Lewis & Clark County

A STRIKE OF HIGH-GRADE GOLD AND SILVER ORE has been made in the Marysville district by a prospector named William Smigaj. The claim where the strike was made lies between the Gloster and Empire mines, and the vein is between 2 and 4 ft. wide.

Silver Bow County

RELIANCE—A fine vein of lead, silver and copper ore has been opened at a depth of 95 ft. in a shaft being sunk on the vein in these claims in the Moose Creek district, 17 miles due south of Butte. The property is being operated by D. M. Adams, who located the claims several years ago.

NEVADA

Churchill County

NEVADA HILLS MINING CO. (Fairview)—The company has paid off all its indebtedness.

NEW YORK ORE MINING CO. (Wonder)—This company, which controls the Goldfield Oro Mining Co., recently purchased four properties in the Wonder district, the Vulture, Bald Eagle, Golconda and Dickey V.

Clark County

YELLOW PINE MINING CO. (Goodsprings)—The company is now shipping daily 60 tons of zinc concentrate and 15 tons of lead concentrate, the mill having resumed operations after a shutdown of 90 days. Owing to the low price of spelter, no shipments were made during the summer, but a force of men was kept at work on development in the mine. The new oreshoot on the second level was followed to the third level, and a considerable tonnage blocked out. On the sixth level a large shoot of zinc-lead carbonates was recently encountered. The oreshoot is 40 ft. in width and bids fair to develop into the largest single shoot yet discovered in the mine. During the summer, the mill was thoroughly overhauled, and several changes were made with a view to increase capacity; the storage bin has been enlarged and new concentrating tables added. The company will also install a 100-hp. gas engine in the mill to replace the steam plant now in use, and is contemplating the installation of a filter plant to treat slime. The company has maintained its regular dividend of 2c. per share, paid monthly.

Humboldt County

CODD LEASE (Rochester)—Regular shipments of 70 tons per day are being made.

Lincoln County

CONSOLIDATED NEVADA-UTAH (Pioche)—The Pioche and other mining properties formerly owned by the old Nevada-Utah Mines & Smelter Corporation, have been reorganized. About 50% of the old company's shares, totaling 1,500,000, paid the 50c. assessment, thereby making available for carrying out reorganization approximately $350,000. The new management has pledged itself to carry forward an extensive program of development work and has retained as consulting engineer Allen H. Rogers, who some months ago, made an examination of the property. A period of fully eight months will elapse before the program mapped out for the development work will be completed.

Lyon County

BURLINGTON-NEVADA (Mason Pass)—Shipments have been delayed recently on account of the destruction of the roads by heavy rains.

KIEMAN PROPERTY (Mason Pass)—The 40-ft. shaft has struck ore, and a tunnel, now 150 ft. in, is being driven to cut the oreshoot at depth.

ADAMS GYPSUM MILL (Mound House)—This plant will be further enlarged. The mill is running three shifts per day at full capacity, and five cars of plaster, as well as considerable crude gypsum are being shipped daily.

MASON VALLEY MINES CO. (Thompson)—Ore receipts at the smelting plant for the week ended Aug. 28, 1913, were as follows: From Mason Valley mine, 2012 tons; from Nevada-Douglas, 948 tons; from other mines, 1151 tons; total, 4111, or a daily average of 587 tons. During the same week five cars of matte were shipped. Power troubles Aug. 24 resulted in the first freeze-up in the history of the smelting plant.

NEVADA-DOUGLAS (Ludwig)—Development in the Copper Castings section is giving satisfactory results. On No. 1 level, several hundred feet of development has been done, and the oreshoot has been proved 30 ft. wide. On the 350-ft. level a crosscut has been driven from the shaft to the vein, and drifting on the vein is now in progress. On the eighth level, south of the main shaft, a shoot of chalcopyrite ore has been cut. From the main drift on this level a cross cut will be driven under the big oreshoot in the 703 stope above. On Douglas Hill the Pearse drift is now in a shattered country showing some copper, while on the 50-ft. level a crosscut to the north has cut 25 ft. of 8% copper ore. The new leaching plant will be erected near the town of Hudson, on the Copper Belt R.R. The mill site has been surveyed and plans for the building are being drawn. It is planned to build a plant of 500 tons capacity, and it is expected that all the units will be in operation early in 1914.

Mineral County

AURORA CONSOLIDATED (Aurora)—Five auto trucks and 300 horses are hauling material from Hudson for the new mill, on which 100 men are working. Grading has been completed, but it will be a month before all the concrete foundations are finished. Some of the retaining walls are in and the concrete for the main ore-bins is now being poured. The machinery is now ready for shipment; some of it is already at the mill site, and all the lumber has arrived.

NEW MEXICO

Socorro County

MAUD (Mogollon)—The new shaft has reached a depth of a little over 500 ft. Good ore is being mined and sent to one of the custom mills.

OAKS (Mogollon)—Development work in East End tunnel group is producing some fine ore, which is being milled in one of the local plants. Another lease is about to be let.

ERNESTINE (Mogollon)—The main shaft has reached a depth of 150 ft. below the old workings. Levels are being opened at regular intervals to intersect the ore encountered in the upper zones.

OREGON

Josephine County

THREE LODES (Galice)—Arrangements have been made for clearing and grading ground for the installation of crushers and pulverizers, jig concentrators and other machinery.

Baker County

DRILLING ON THE MILWAUKEE CLAIMS on Granite Creek is continued in an effort to determine their value as dredging ground.

JAMES B. SIPE MINING CO. (Sumpter)—A public sale of the holdings of this company was held Aug. 25, and the property was bid in by James B. Sipe, of Pittsburgh, Penn., who, with his associates, have spent over $100,000 in development work. The sale was made to obtain the balance of the unpaid purchase price due on claims held by the company, amounting approximately to $40,000, and also for the purpose of readjusting the affairs of the company and reorganizing in a way to carry on the development and operation of the property.

Josephine County

GRANTS PASS & CRESCENT CITY R.R. is to be built by the Interstate Construction Co., contracts having been signed by the officials of this company and the city of Grants Pass. In view of the fact that the railroad will tap valuable mining ground as yet undeveloped a number of mining men are in the county looking over the situation.

ALMEDA CONSOLIDATED MINING CO. (Galice)—Judge Calkins, on application of the attorney-general, on action brought by Corporation Commissioner Watson, has appointed Thomas S. Burley, of Tacoma, Wash., receiver for this company. The receiver is a practical mining man. All claims will be met and the smelting plant will be put in running condition and matte will be shipped. Mr. Burley and associates will put up the necessary money to start smelting.

SOUTH DAKOTA

Lawrence County

TROJAN (Trojan)—A Lea recorder has been installed at this mill. Construction work on the additions to house tube mill, solution storage tanks, thickeners and agitators, is proceeding rapidly.

BISMARCK (Flatiron)—A Bury two-stage compressor, with air cylinders 14x7½x10 in., belt driven from a 50-hp. motor, has just been installed; additional drills will be used in the mine. The ore is broken in a big opencut, dropped through chutes and trammed to the mill. Some expensive stripping is necessary at present. The operations in July showed a good profit.

WASP NO. 2 (Lead)—A small steam engine has been put in operation to draw the cars of waste which are loaded by the steam shovel in the course of stripping. A system of belt conveyors has just been completed for removing the tailing from the leaching tanks to the dump. On account of scarcity of water and danger of polluting a stream, it is out of the question to sluice these tanks. Six conveyors, each 70 ft. in length, run under the discharge gates in the bottom of the tanks. These conveyors dump onto a belt 90 ft. long, running at right angles to those first mentioned, and this belt discharges on to a 150-ft. belt which delivers the tailing to the dump. Some difficulty has been experienced on account of moisture causing the tailing to stick to the belts, but it is hoped to overcome this by installing revolving brushes. With the belts the time of discharging a tank of 420 tons has been cut from 8 to 3½ hours.

Pennington County

BLACK HILLS TUNGSTEN CO. (Hill City)—This company is employing a crew of men in both mining and mill construction work. The property is to be equipped with a small concentrating plant.

FIRST NATIONAL GOLD MINING COMPANY (Hill City)—This company has been organized by Detroit men to take over the Forest City property. The property consists of 20 acres, on which a shaft 110 ft. deep and lateral workings disclose a shoot of high-grade, free-milling ore. A contract has been let to sink the shaft an additional 200 ft., and work was to have been started the first week in September. A 10-stamp mill was erected last autumn, which is described as a nice plant of its kind. It is equipped with Pierce amalgamators and Wilfley tables. It is probable that a cyanide annex will be added.

TENNESSEE

Knox County

AMERICAN ZINC, LEAD & SMELTING CO. (Mascot)—The mine and mill are reported to be doing finely. A little high-grade spelter has been made from this ore at Hillsboro, Ill., but the output has not yet become regular.

TEXAS

Cass and Marion Counties

EAST TEXAS BROWN ORE DEVELOPMENT CO (Jefferson)—This company, operating iron-ore deposits in the extreme northeastern part of the state, and which recently shipped 3000 tons of ore from Port Bolivar to Philadelphia, has a contract to ship 150,000 tons to that city and an option to ship 500,000 tons if the ore already contracted for proves satisfctory. Shipping facilities limit production to 7000 tons per month. The methods of mining and handling the ore are said to be crude, compared to uptodate practices in the older iron fields.

UTAH

Summit County

MINES OPERATING CO. (Park City)—Complaints regarding chlorine fumes are being investigated, with a view to remedying conditions if this is necessary.

THOMPSON-QUINCY (Park City)—Assays running well in silver have been obtained from the east drift of the raise driven from the 900-ft. level of the Daly-West.

AMERICAN FLAG (Park City)—The vein between the 1000- and 900-ft. levels has opened to 3 ft. and 7 in. in places, and carries high-grade silver-lead ore with gold and some copper. Shipments for the week ended Aug. 9 amounted to 73 tons. The ore runs $60 and more per ton.

SILVER KING CONSOLIDATED (Park City)—The three-compartment shaft being sunk under contract by McIlwee & Co. was sunk 75 ft. in 18 days, ended Aug. 4. The best progress previous to this was 100 ft. in 31 days. When the 1700 level is reached sinking will be suspended, and a station cut. The shaft will be carried down another 100 ft. to the 1800-ft. level, which will complete the contract.

DALY-JUDGE (Park City)—Production for the first six months of 1913 amounted to 25,514 tons of concentrating ore, 2155 tons of shipping ore, or a total of 27,669 tons dry weight. Throughout the period 50 to 60 ft. of development was done daily at a monthly cost of about $16,280. This work was done from the 500 to the 2300-ft. levels, the greater part being toward the Bonanza Flat section, following the fissure systems, the faces of the various drifts being kept far ahead of the orebodies. The amount of development thus far for 1913 is almost equal to that for the whole of 1912. Average monthly earnings were $15,484, and the available balance July 1, 1913, was $527,385. Two dividends were paid during the period, amounting together to $90,000.

WASHINGTON

Lincoln County

REARDAN (Davenport)—A new pump has been installed at this gold mine and ore assaying as high as $17 per ton is being taken out.

Okanogan County

CARL FREDERICK—Operations at this mine which has been idle for some little time have again been resumed by Chris Bernhart, owner.

LONE STAR (Conconully)—Preparations are being made for ore shipments. The mine is owned by the Syndicate Development Co., of Seattle.

WISCONSIN

Platteville District

ALDERSON—Charles Kistler is prospecting by drill on this eighty three miles southwest of Platteville.

DUGDALE—A Milwaukee company is prospecting for lead ore on this farm three miles northeast of Platteville.

KLAR PIQUETTE (Platteville)—A 20-ft. face of ore was penetrated in the new shaft on the west end of this lease; a Lawson loop aërial tram has been installed to connect with the mill.

MINERAL POINT ZINC CO. (Mineral Point)—This company has purchased the Baker farm near Whitson Junction comprising old mine workings that produced large quantities of drybone.

CANADA

British Columbia

BRITISH COLUMBIA GOLD PRODUCTION FOR 1912 totalled $5,322,000. Rossland produced one-half, or $2,730,000; the Boundary district is credited with $2,167,000 and the Nelson district with $361,000. The Nickel Plate mine at Hedley yielded $775,000 from free-milling ore. The total mineral production of the province was $32,440,000. The silver production was $1,810,000, of which the Slocan produced 61%, the Fort Steele district 12%, and the Lardeau and Nelson districts the rest. The total lead production was worth $1,806,000; copper, $8,405,000; zinc, $316,000; and coal, $9,200,000.

BLACK DIAMOND (Athalmer)—This group on Toby Creek has been bonded to Dr. H. Schurz, of San Francisco. It is a high-grade silver-lead property with considerable ore blocked out.

SILVER HOARD (Kaslo)—As a result of having found a larger and better oreshoot at the 100-ft. level than was found at the 50-ft. level, it has been decided to sink a two-compartment shaft to a depth of 500 ft. A compressor to be run by water from the north fork of Cedar Creek is to be installed to furnish power for drills and hoisting. This compressor will embody some new features and is the design of Prof. Francis A. Thompson, of the State College of Mines, Pullman, Wash.

CUMSHEWA (Moresby Island)—At this property a very rich strike has been made. Over $100,000 has been spent on this property by an English company. The vein is small on the surface, cutting slates of early Jurassic or late Triassic age, and occurs near a granite intrusion. The ore showed blende and small amounts of galena and gave assays in places of $150 and upward in gold, on the surface. An adit was driven along the vein. At a favorable spot in the tunnel a winze was started, and as a depth of 200 ft. was approached, some free gold was noticeable in the ore. At a depth of 226 ft. the winze was in 4½ ft. of ore assaying $320 per ton, 14 in. of which ran, $1100 per ton. The vein at this place was 6 ft. wide and showed every indication of persistency.

Ontario

AT THE PEAT BOG AT ALFRED in the Ottawa district the experimental plant established by the Mines Branch of the Canadian government and afterward disposed of to private interests, has had a successful season. New improved machinery has been installed and about 2000 tons of peat fuel produced, which will shortly be placed on sale. About half of the output will find a market in Ottawa at about $5 per ton. There are at present only two commercial peat plants in operation in Canada, the other being at Farnham, Quebec.

O'BRIEN (Cobalt)—A large tube mill is now being installed, which with other changes is expected to increase the capacity of the plant from 100 to 150 tons.

HUDSON BAY (Kirkland Lake—The gang of men which has been doing surface trenching on the claims has been paid off and it is stated that the properties will be abandoned.

TOUGH-OAKES (Swastika)—Tests are now being made in the 5-stamp mill with a view of securing data for use in planning the scheme of treatment which will be used in the 150-ton mill which it is proposed to erect soon. In the meantime shipments of high-grade ore will be made to the smelters. All of this ore is being taken from development on the No. 2 vein.

DOME (South Porcupine)- Work has been started on the foundations for the addition to the 40-stamp mill. The addition will consist of 40 stamps, Dorr classifiers, 3 Dorr thickeners, 4 sets of Merrill classifiers, 4 sets of plates, 2 storage tanks, 3 pumps, 3 Merrill presses and 6, 40x10-ft. leaching tanks for the sands. Heretofore, the practice has been to slime and cyanide the total tonnage, but in the future the sand will be separated and cyanided in the leaching tanks provided in the new addition.

BUFFALO MINES CO. (Cobalt)—This company has been working a gang of about 20 men during the last two months on the Ribble claims in West Shining Tree. It is said they have opened up on the surface an oreshoot 200 ft. long and 20 ft. wide of $15 ore. This has caused some excitement and prospectors are going into the district which was originally staked in the summer of 1911. Rich gold samples were found, but the surface trenching and test pitting showed the veins to be too small and too narrow and the grades too low to warrant any extensive development.

MEXICO

Jalisco

SAN PEDRO ANALCO (San Pedro Analco)—These Hostotipaquillo district mines, owned by a Mexican company, have been taken over on a working contract by the San Rafael y Anexas company, one of the big operators of the Pachuca district of Hidalgo; it owns mines in the Parral district of Chihuahua as well. Negotiations for the purchase of the San Pedro Analco mines by the Real del Monte Co. (U. S. Smelting, Refining & Mining Co.) failed some time ago because of a disagreement over the price.

MAGISTRAL-AMECA (Ameca)—This American company, owning the Magistral copper mine in the Ameca district, is steadily shipping concentrates to the Aguascalientes smelters. The company is mining, on an average, 125 tons per 24 hr., and the monthly output of concentrates averages 500 tons. The mill has treated as high as 82 tons of ore in 12 hr., and it is expected soon to increase the daily average of ore milled. The concentrates have a value of from 80 to 85 pesos on board the cars at Ameca, the shipping point. The company's operating expenses are covered by returns from one-fourth of the present production.

Puebla

TEZIUTLAN COPPER CO. (Aire Libre)—Smelting was discontinued Sept. 5, the fuel supply having been exhausted. No copper has been shipped since about the middle of August, owing to interruption of railway traffic by revolutionists.

GERMANY

OIL HAS BEEN STRUCK AT HANOVER, according to a despatch to the "National Zeitung," at a depth of 1600 ft. by borers for potash, and 300 bbl. per day have been produced since Aug. 30, the oil being of good quality. The secret was kept by the finders for some days, but since it has become public, the surrounding land has been rapidly acquired by speculators. Oil has been produced near Hanover for many years, the wells there, together with those in Alsace, supplying about 1,000,000 bbl. annually. The above despatch, therefore, probably indicates merely that the field is more extensive than was supposed. Nevertheless, in view of Germany's efforts to establish her independence of the Standard Oil Co., the discovery is highly important.

THE MARKET REPORT

METAL MARKETS

Copper, Tin, Lead and Zinc

Copper—From Sept. 3 to Sept. 8 there was almost a perpendicular rise in price under the influence of urgent demand which resulted in transactions amounting to many millions of pounds. The advance was so sharp that on most of the days there was a wide difference between the morning and afternoon prices. The openly quoted prices for electrolytic, including freight, and subject to discount, were as follows: (4th) 16⅛@16¼c.; (5th) 16¼@16½c.; (6th) 16⅜@16½c.; (8th) 16½@16¾c.; (9th) 16¾c.; (10th) 16⅝@16¾c.

By the end of Sept. 4 domestic consumers were actually paying 16¼c., delivered, equivalent to 16.10c., cash, New York. On Sept. 5 transactions varied a good deal, on business both for domestic and foreign shipment. Sales to domestic consumers were made on the 6th at 16⅜c., delivered, usual terms, while shipments to Europe were made at prices netting as high as 16.30c. On the morning of the 8th, the market opened firmly at 16½c., delivered, usual terms, and sales to Europe and to Connecticut, netting 16.30@16.35c. were made. Toward the end of the day some large sales were made at 16¾c., delivered, usual terms, equal to 16.60c., cash, New York, on the domestic business. The transactions of this day amounted to millions of pounds. On Sept. 9 the market was firmly established at 16.70@16.75c., delivered. Most of the agencies stood firmly at the higher figure, but certain houses offered concessions of a few points. Business became slack and toward the close of the day there were sales at 16.65c., delivered, usual terms. On Sept. 10, business continued slack and there were sellers at 16⅝c., delivered, although most of the agencies maintained their previous price of 16¾c., asked.

The business of the week was divided among domestic and foreign shipments. It would be difficult to estimate the division with any degree of precision. The statistics issued on Sept. 8 showed that the available supply of copper is very small indeed. The quantity of electrolytic copper in the hands of the refiners was but little over 20,000,000 lb., or less than the normal production of one week. The principal producers are well sold ahead and are meeting with difficulties in making their deliveries on time. Stocks of copper have dwindled to a dangerously low point, so much so that the least disturbance in the production at the present moment would create an actual shortage of copper. Under these conditions the market, of course, has been strong and advancing.

Business in Lake copper came to a standstill this week. Barring a few remnants of supply existing here and there, some carload lots, nobody now has any Lake copper except the Calumet & Hecla. That company is now understood to have withdrawn from the market. Its remaining supply will probably be reserved for its regular customers. In the absence of any business whereof we can learn, we are obliged to quote Lake copper in a purely nominal way, quoting it at ¼c. per lb. about the mean price for electrolytic.

At the close we quote electrolytic copper at 16.40@16.60c. and Lake at 16.75c. (nominal). We quote casting copper nominally at 16.15@16.20c. as an average for the week.

Base price of copper sheets is now 22c. for hot rolled and 23c. for cold rolled. Full extras are charged and higher prices for small quantities. Copper wire is 17¾c., carload lots at mill.

Exports of copper from New York for the week were 9243 long tons. Our special correspondent gives the exports from Baltimore at 1597 tons for the week.

A reader of the "Journal" complained that he had tried to buy 200,000 lb. of electrolytic copper last week and could not get it within ¼c. of our quotations. Upon inquiry we learned that he had been named a fancy price upon 50,000 lb. by a certain agency, reason not asked nor stated. The same agency on its total business aggregating some millions of pounds during that week averaged within 0.02½c. of the average of our quotations. We do not quote the copper market on jobbing or retail business. The same remark applies to the criticisms of a journal that is interested in that character of market.

The London standard market, which on Sept. 4 was £73 for spot and £72½ for three months, advanced 15s. on the 5th. On the 8th spot was £74⅞ and three months £73¾. On the 9th the realization of speculative holdings set in. This was to be expected after the recent prolonged advance. In consequence, the market declined on the 9th to £73¼ for spot and three months. On the 10th spot closes at £73, with three months £72⅞.

Tin—The market in London eased off considerably during the week under review. Orders from this side were lacking and not much support was offered by the bull element. Consumers in this market were rather shy and sales by dealers were made under the cost of import. The market closes easy at £193¼ for spot and £192½ for three months, and about 42½c. for September tin here.

DAILY PRICES OF METALS

NEW YORK

Sept.	Sterling Exchange	Silver	Copper		Tin	Lead		Zinc	
			Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
4	4.8570	59⅜	16⅜ @ 16½	16.00 @ 16.10	43¾	4.75	4.65 @ 4.70	5.75 @ 5.85	5.60 @ 5.70
5	4.8545	59¾	16⅜ @ 16½	16.10 @ 16.30	43⅛	4.72½ @ 4.75	4.62½ @ 4.65	5.75 @ 5.85	5.60 @ 5.70
6	4.8560	59½	16⅜ @ 16½	16.20 @ 16.30	43⅛	4.70 @ 4.75	4.60 @ 4.65	5.75 @ 5.85	5.60 @ 5.70
8	4.8560	59⅝	*16.60	16.30 @ 16.60	42¾	4.70 @ 4.75	4.60 @ 4.65	5.75 @ 5.85	5.60 @ 5.70
9	4.8560	59⅝	*16.80	16.50 @ 16.60	42⅝	4.70 @ 4.75	4.60 @ 4.65	5.75 @ 5.85	5.60 @ 5.70
10	4.8570	59¾	*16.75	16.40 @ 16.60	42½	4.70 @ 4.75	4.60 @ 4.65	5.75 @ 5.85	5.60 @ 5.70

*Nominal.

The quotations herein given are our appraisal of the market for copper, lead spelter and tin based on wholesale contracts with consumers without distinction as to deliveries; and represent, to the best of our judgement, the bulk of the transactions, reduced to basis of New York, cash, except where St. Louis is specified as the basing point. The quotations for electrolytic copper are for cakes, ingots and wirebars. The price of electrolytic cathodes is usually 0.05 to 0.10c. below that of electrolytic. We quote casting copper at 0.15@0.20c. below the price for electrolytic. The quotations for lead represent wholesale transactions in open market for good ordinary brands, both desilverized and non-desilverized; the specially refined corroding lead commands a premium. The quotations on spelter are for ordinary Western brands; special brands command a premium. Silver quotations are in cents per troy ounce of fine silver.

LONDON

Sept.	Silver	Copper			Tin		Lead, Spanish	Zinc, Ordinaries
		Spot	3 Mos	Best Sel'td	Spot	3 Mos		
4	27 9/16	73	72½	77½	198½	197	21	21½
5	27 7/16	73¾	73	78½	195	194	20⅝	21½
6	27½	....	....	....	....	....	....	....
8	27 9/16	74⅞	73⅝	80	195	194	20⅝	21¼
9	27 9/16	73¼	73¼	79	194	192¾	20⅝	21¼
10	27⅝	73	72⅞	78¾	193¼	192½	20⅝	21¼

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb., except silver which is in pence per troy ounce of sterling silver, 0.925 fine. Copper quotations are for standard copper, spot and three months, and for best selected, price for the latter being subject to 3 per cent. discount. For convenience in comparison of London prices, in pounds sterling per 2240 lb., with American prices in cents per pound the following approximate ratios are given: £10 = 2.17¼c.; £15 = 3.26c. = £25 = 5.44c.; £70 = 15.22c. Variations, £1 = 0.21¾c.

Lead—The market is dull and somewhat easier. Lead at St. Louis is quoted 4.60@4.65 c., and New York 4.70@4.75c.

The London market is quiet, with Spanish lead quoted at £20⅝ and English lead 15s. higher.

Spelter—The market is quiet and without special feature. St. Louis is quoted 5.60@5.70c.; New York, 5.75@5.85c. At 5.70c. St. Louis there are sellers over.

At London good ordinaries are quoted £21¼ and specials £21⅝.

Base price of zinc sheets stands unchanged at $8 per 100 lb. basis, less 8% discount, f.o.b. cars, Peru, Ill. Extras and discounts unchanged.

Brass Prices are announced as follows to date from Sept. 8: Sheets, high brass, 17c. net per lb.; low brass, 18⅞c. Wire, high brass, 16¾c.; low brass, 18⅞c. Rods, high brass, 16¾c.; low brass, 19⅝c. Tubes, brazed, or open seam, 21½c. Angles and channels, 21½c. Scrap allowances are 11½c. net per lb. for high brass and 12⅞c. for low brass.

Other Metals

Aluminum—The market is quiet, and still waiting on the tariff. Domestic No. 1 ingots are selling for 22@22¼c. per lb., and foreign, in bond, at 18 cents.

Antimony—The market is extremely dull. Consumers are living from hand to mouth in anticipation of an early change in the tariff. Prices are 8.30@8.50c. for Cookson's; 8@8.12½c. for Hallett's; and 7.25@7.50 for Chinese, Hungarian and outside brands.

Quicksilver—The market is fair and steady, with prices unchanged. New York quotations are $40 for both domestic and export. London is £7 5s. per bask, and £7 quoted from second hands.

Gold, Silver and Platinum

Gold remains on the open market at 77s. 9d. per oz. for bars and 76s. 4d. per oz. for American gold. The receipts are chiefly from the Cape and South America, with engagements for Egypt.

Imports of gold at New York, week ended Sept. 6, were $851,652; exports, $25,000.

Iridium—The trade in this metal is dull, with $83@85 asked.

Platinum—The market has now become steady, and $43.50@45 per oz. is being paid. For hard metal, $47.50@50 is being quoted.

Silver—The tendency of silver has been to slightly higher prices, and advices would indicate some farther improvement in the market this fall may be anticipated. It is thought the India government may make purchases on a moderate scale this year, especially if the later rains maintain the promise to the farming sections which has been created by the favorable season so far.

Imports of silver at New York, week ended Sept. 6, were $263,579, and exports were $1,041,054. Additional exports of $196,215 have been reported for the week ended Aug. 30, making the correct total $902,198.

Zinc and Lead Ore Markets

PLATTEVILLE, WIS.—Sept. 6

The base price paid this week for 60% zinc ore was $47@48 per ton. The base price paid for 80% lead ore was $58@59 per ton.

SHIPMENTS WEEK ENDED SEPT. 6, 1913

	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Week	2,923,380	169,600	966,920
Year to date	102,133,810	4,757,590	41,399,870

Shipped during week to separating plants, 2,047,480 lb. zinc ore.

JOPLIN, MO.—Sept. 6

The high price of blende is $52, the base per ton of 60% zinc ranging from $46@49 for choice grades and $45@47 base for blende carrying an excess of 8% iron. Calamine sold on a base of $21@24 per ton of 40% zinc. The average of all grades of zinc is $45.10 per ton. Lead was unchanged at $58 per ton of 80% metal content, and the average of all grades is $56.14 per ton.

SHIPMENTS WEEK ENDED SEPT. 6

	Blende	Calamine	Lead	Value
Totals this week..	12,228,860	1,751,810	1,877,530	$369,155
Totals 36 weeks..	388,812,700	29,110,180	63,529,520	$10,782,014

Blende value, the week, $291,465; 36 weeks, $8,725,384.
Calamine value, the week, $23,770; 36 weeks, $373,171.
Lead value, the week, $53,920; 36 weeks, $1,683,459.

IRON TRADE REVIEW

NEW YORK—Sept. 10

Steel-market developments thus far in September have not proved reassuring. There is no increase in the volume of business booked, over the August average, and it is possible that on the whole there has been an actual diminution Such buying as occurs is practically confined to the filling of immediate requirements, and prices here and there have shown additional weakness in the past 10 days. The general list has not definitely receded, as the important products are still quotable, in the open market, at last week's range, but in spots there is more shading.

Some of the heavy steel orders have now been definitely placed. The Kresge store at Detroit, Mich., has placed a contract for 1700 tons of fabricated steel; the Maine Central has ordered 12 small bridge spans and one large, calling for 2400 tons, and the New York Central for 400 tons. Other large contracts are rumored, but it is said they will be held up until prices go down materially.

PITTSBURGH—Sept. 9

Production of steel continues at maximum rate, and is possibly a trifle heavier than in July and August, as no productive units have been closed, and the mills naturally work better in present weather conditions than in July and August. It is insisted that jobbers and manufacturing consumers have been drawing from stocks, rather than adding to them, which would indicate that actual consumption has been at record rate, or very close to it, while the depleted condition of stocks—as claimed—would suggest that freer buying will soon become a necessity if consumption is to be maintained. There are no prospects of curtailment in consumption in the near future, except by the railroads, as their outside work is certain to decrease steadily in the next two or three months, with decreased shipments of rails and track material, while as to cars the orders on books of car builders will make them good consumers of steel until very nearly the close of the year.

Pig Iron—The September coke business seems all to have been placed, and at the full price of $2.50 unless for one or two sales of coke of second grade, but today it is reported that spot coke can be picked up at concessions of 25 to 30c., without there being any absorbing power in the market. The pig-iron situation is extremely quiet. There is little inquiry for any grade. In foundry iron so many purchases were made for third quarter only that further buying is expected in the next 30 days. There is no prospect of the Steel Corporation buying bessemer iron, as has frequently been rumored from the East. Bessemer has been somewhat scarce, but one of the Josephine stacks has lately been put on this grade, which may change the aspect. On the whole production seems to be well regulated to consumption, and furnaces are rigidly adhering to recently quoted prices, the market being quotable as follows: Bessemer, $15.75@16; basic, $14; malleable, $14.25; No. 2 foundry, $14; gray forge, $13.50, at Valley furnaces, 90c. higher delivered Pittsburgh.

Ferromanganese—The market continues quiet, the nominal price on prompt and contract being $56, Baltimore, with $2.16 freight to Pittsburgh, but dealers frequently shade this figure $1 per ton on prompt lots.

Steel—The market for billets and sheet bars is finding its level more slowly than expected, since the old basis was definitely departed from. Openhearth steel can be bought at $24 for billets and $25 for sheet bars, at maker's mill, Pittsburgh or Youngstown, but offerings at this level are limited. Hardly any mill quotes more than a dollar per ton higher, and there are rumors that still lower figures than here quoted have been named. As to bessemer steel there are no quotations as low as on openhearth, but the market has not been seriously tested since most buyers are holding off awaiting developments.

Sheets—Production has increased, over 90% of the independent mills being in operation, while the leading interest is running about 85% of its mills. Bookings are almost entirely for early shipment, and are hardly keeping pace with shipments. Additional cuts are rumored, in instances, from the general level, which remains quotable as follows: Blue-annealed, 10-gage, 1.65c.; black, 28-gage, 2.15c.; galvanized, 28-gage, 3.20c.; painted corrugated, 28-gage, 2.35c.; galvanized corrugated, 28-gage, 3.25c., per lb

IRON ORE

Imports via the port of Baltimore during the week ended Sept. 8, included 13,960 tons of iron ore from Daiquiri and Felton, and 50 tons ferromanganese from Rotterdam.

OTHER ORES

Imports and Exports in Germany of Ores other than those of iron and manganese, half-year ended June 30, metric tons:

	Imports		Exports	
	1912	1913	1912	1913
Gold and silver ores	918	987	1	1
Copper ore	12,669	14,022	10,950	14,400
Tin ore	7,650	9,170	.....	.....
Lead ore	68,421	70,087	1,797	2,437
Zinc ore	122,459	174,886	19,206	18,040
Nickel ore	10,249	6,643	.....	.....
Miscellaneous ores	14,413	19,316	3,093	6,792
Chrome ore	10,838	7,731	284	328
Pyrites	465,694	508,957	13,504	16,966

Imports of slag and slag products for the half-year were 614,112 tons in 1912 and 655,245 in 1913; exports were 60,910 tons in 1912, and 86,395 tons this year.

COKE

Connellsville Coke—Operators have had more trouble than for July and August in closing up for September such furnaces as were not covered for longer periods. There have been rumors that some coke went at concessions from the $2.50 price, but these cannot be confirmed as relating to first-grade coke. At any rate, the major portion of the tonnage required for September has been taken at the fall price, with two or three consumers not yet fully covered for the month. The New Jersey Zinc Co. is understood to have purchased 25,000 or 30,000 tons for delivery from September over the last four months of the year at $2.50, but guaranteed against decline. It is stated on the part of certain operators that they will further curtail production to meet the situation. We quote: Prompt furnace, $2.50; contract furnace, $2.50; prompt foundry, $3; contract foundry, $3 per ton at ovens.

The "Courier" reports production in the Connellsville and lower Connellsville region in the week ended Aug. 30 at 403,030 tons, an increase of 33,554 tons, and shipments at 405,115 tons, an increase of 35,792 tons. This makes the tonnages larger than the average for July and August, which was about 380,000 tons weekly, while the average in the first half of the year was 409,000 tons weekly. It is hard to understand how production and shipments could have been so large lately, considering the material decrease in pig-iron production, but as to shipments in the week ended Aug. 30, it is to be remembered the holiday at the beginning of the following week was doubtless being provided for.

Foreign Coal Trade of Germany six months ended June 30, metric tons:

	Exports	Imports	Excess
Coal	16,368,690	5,028,462 Exp.	11,340,228
Brown coal	30,464	3,502,911 Imp.	3,472,447
Coke	3,405,212	253,542 Exp.	3,151,670
Briquettes	1,637,500	71,229 Exp.	1,566,277
Total	21,441,866	8,856,144 Exp.	12,585,722

Of the briquettes exported 439,865 tons were made of brown coal or lignite.

Coal Trade of Belgium half-year ended June 30, metric tons:

	Imports	Exports	Excess
Coal	4,482,500	2,400,800 Imp.	2,081,700
Coke	793,500	676,300 Imp.	117,200
Briquettes	212,900	181,100 Imp.	31,800
Total	5,488,900	3,258,200 Imp.	2,230,700
Total, 1912	4,636,900	3,359,100 Imp.	1,277,800

Coal production reported for the half-year was 11,221,550 tons, an increase of 86,260 tons over last year.

CHEMICALS

NEW YORK—Sept. 10

General business is dull. This does not seem to be solely a matter of the tariff, but of underlying small chemical consumption.

Arsenic—The market is dull, and what business is placed is at about $3 per cwt.

Copper Sulphate—The bluestone market has not yet reflected the spurt in copper prices, and prices are unchanged at $5 per 100 lb. for carload lots and $5.25 per 100 lb. for smaller parcels.

Nitrate of Soda—This is the dull season for nitrate, but under the influence of the nitrate convention the market stands firm at 2.40c. for all positions.

COPPER SMELTER'S REPORTS

This table is compiled from reports received from the respective companies except in the few cases noted (by asterisk) as estimated, together with the reports of the U. S. Dept. of Commerce as to imported material, and in the main represents the crude copper content of blister copper, in pounds. In those cases where the copper contents of ore and matte are reported, the copper yield then is reckoned at 97%. In computing the total American supply duplications are excluded.

	April	May	June	July	August
Alaska shipments	1,730,252	1,771,508	2,203,191	2,705,136	.....
Anaconda	23,800,000	25,600,000	21,500,000	22,100,000	22,500,000
Arizona, Ltd.	3,100,000	3,200,000	3,000,000	2,600,000	1,800,000
Copper Queen	8,210,166	8,301,605	7,477,936	8,369,607	8,252,404
Calumet & Ariz.	4,500,000	4,300,000	4,000,000	3,800,000	.....
Chino	3,925,409	3,883,611	3,682,706	4,831,185	6,050,867
Detroit	1,856,517	2,001,633	1,750,601	1,549,224	2,187,223
East Butte	1,400,000	1,268,595	1,055,646	.....	.....
Mammoth	1,450,000	1,700,000	1,750,000	1,800,000	1,750,000
Giroux*	600,000	625,000	610,000	610,000	.....
Mason Valley	1,264,304	1,186,560	1,097,014	908,892	.....
Miami	.....	1,943,900	2,612,000	.....	.....
Nevada Con.	5,650,000	5,933,275	6,344,863	5,403,919	.....
Ohio	690,001	650,071	537,400	601,700	.....
Old Dominion	3,040,000	2,749,000	2,511,000	2,526,000	2,524,000
Ray	4,379,128	4,384,400	4,392,612	4,097,000	.....
Shannon	1,238,000	1,080,000	924,000	880,000	1,248,000
South Utah	132,267	200,000	185,000	140,000	.....
Tennessee	1,718,188	§1,037,115	1,379,220	1,247,804	.....
United Verde*	3,000,000	3,000,000	2,900,000	.....	.....
Utah Copper Co.	9,539,847	10,003,227	11,637,949	9,849,043	.....
Lake Superior*	17,000,000	18,705,000	16,500,000	17,500,000	9,700,000
Non-rep. mines*	6,000,000	6,300,000	6,000,000	6,200,000	.....
Total prod.	104,224,079	109,824,500	104,051,138	.....	.....
Imports,bars, etc.	25,578,297	22,205,942	18,255,267	.....	.....
Total blister	129,802,376	132,030,442	122,306,405	.....	.....
Imp. ore & matte.	7,177,363	10,528,562	7,497,002	.....	.....
Total Amer.	136,979,739	142,559,004	129,803,407	.....	.....
Miami†	2,312,900	.....	.....	2,890,000	3,097,500
Shattuck-Arizona	1,158,326	1,026,170	1,059,625	1,019,388	.....
Brit. Col. Cos:					
British Col. Cop.	794,000	.....	.....	.....	.....
Granby	1,857,452	1,782,570	1,789,000	1,664,102	1,847,344
Mexican Cos.:					
Boleo†	2,811,200	2,424,800	1,984,640	2,240,720	.....
Cananea	3,581,690	2,272,000	2,908,000	3,328,000	3,186,000
Moctezuma	2,753,240	2,695,881	3,438,793	2,693,006	3,542,047
Other Foreign:					
Braden, Chile	1,512,000	1,150,000	1,804,000	1,046,000	1,572,000
Cape Cop., S. Af.	586,880	387,520	414,400	.....	.....
Kyshtim, Russia	2,544,640	1,490,000	.....	.....	.....
Spassky, Russia	974,400	721,280	835,520	.....	.....
Exports from					
Chile	7,616,000	3,584,000	5,824,000	9,856,000	.....
Australia	6,608,000	7,840,000	7,616,000	10,304,000	.....
Arrivals-Europe†	10,545,920	13,661,760	5,277,440	11,728,640	.....

† Boleo copper does not come to American refiners. Miami copper goes to Cananea for treatment, and reappears in imports of blister. From May 1, Miami copper is refined in the U. S. and appears under American mines. From July 1 Miami ore went back to Cananea.

† Does not include the arrivals from the United States, Australia or Chile.

§ In operation only 20 days in May.

STATISTICS OF COPPER

Month	United States			Visible Stocks.		
	U.S.Refin'y Production	Deliveries, Domestic	Deliveries, for Export	United States	Europe	Total
VIII'12	145,628,521	78,722,418	70,485,150	50,280,421	113,299,200	163,579,621
IX	140,089,819	63,460,810	60,264,796	46,701,374	113,568,000	160,269,374
X	145,405,453	84,104,734	47,621,342	63,065,587	107,408,000	170,473,587
XI	134,695,400	69,369,795	55,906,550	76,744,964	103,801,600	180,546,564
XII	143,354,042	58,491,723	65,713,796	86,164,059	96,947,200	183,111,259
Year, 1912	1,581,920,287	819,665,948	746,396,452	.....	.....	.....
I. 1913.	143,479,625	65,210,030	60,383,845	105,312,582	78,491,840	183,904,422
II	130,948,881	59,676,492	72,168,523	123,198,332	77,504,000	200,702,332
III	136,251,849	76,585,471	77,699,306	122,302,890	81,244,800	203,547,690
IV	135,353,402	78,158,837	85,894,727	104,269,270	87,180,800	191,450,070
V	141,319,416	81,108,321	68,285,978	75,549,108	85,948,800	161,497,908
VI	121,860,853	68,362,571	68,067,901	67,474,225	77,235,200	144,709,425
VII	138,074,602	58,904,192	78,480,071	52,814,606	71,904,000	124,808,606
VIII	131,632,362	73,649,801	73,263,469	53,594,945	66,420,480	120,015,385
IX	.....	.....	.....	38,314,037	.....	.....

Note—From Jan. 1, 1913, visible supplies in Europe do not include copper afloat.

Mining Companies—United States

Name of Company and Situation		Shares Issued	Shares Par	Dividends Total	Dividends Latest	Dividends Amt
Acacia, g.	Colo.	1,438,989	$ 1	$ 129,618	Jan. '11	$0.01
Adams, s.l.c.	Colo.	80,000	10	778,000	Dec. '09	0.04
Ahmeek, c.	Mich.	50,000	25	1,950,000	July '13	5.00
Alaska Mexican, g.	Alas.	180,000	5	3,241,381	Aug. '13	0.30
Alaska Treadwell, g.	Alas.	200,000	25	13,385,000	Aug. '13	1.00
Alaska United, g.	Alas.	180,200	5	1,397,150	Aug. '13	0.60
Am. Zinc, Lead & Sm.	U. S.	165,360	25	985,820	Apr. '13	0.50
Anaconda, c.	Mont.	4,332,500	25	78,168,750	July '13	0.75
Argonaut, g.	Cal.	200,000	5	1,200,000	June '10	0.05
Arizona Copper, pf.	Ariz.	1,426,120	1.20	1,831,011	May '13	....
Arizona Copper, com.	Ariz.	1,519,896	1.20	15,983,475	July '13	0.48
Bagdad-Chase, g., pf.	Cal.	84,819	5	202,394	Jan. '09	0.10
Baltic, c.	Mich.	100,000	25	7,750,000	Dec. '12	7.00
Bingham N. H., c.	Utah.	228,690	5	294,219	July 12	0.10
Bonanza Dev., g.	Colo.	300,000	1	1,425,000	Oct. '11	0.20
Bunker Hill Con., g.	Cal.	200,000	1	761,000	Aug. '13	0.05
Bunker Hill & Sul., l.s.	Ida.	327,000	10	14,434,950	Aug. '13	0.20
Butte-Alex Scott, c.	Mont.	74,000	10	111,000	June '13	0.50
Butte & Ballaklava, c.	Mont.	250,000	10	125,000	Aug. '10	0.50
Caledonia, l.s.c.	Ida.	1,300,000	1	52,000	June '10	0.01
Calumet & Arizona, c.	Ariz.	596,353	10	17,714,441	June '13	1.25
Calumet & Hecla, c.	Mich.	100,000	25	122,050,000	June '13	10.00
Camp Bird, g.s.	Colo.	1,100,051	5	9,650,812	Aug. '13	0.24
Centen'l-Eur., l.s.g.c.	Utah.	100,000	5	3,750,000	Apr. '13	1.50
Center Creek, l.s.	Mo.	100,000	10	425,000	July '13	0.05
Champion, c.	Mich.	100,000	25	8,000,000	June '13	1.00
Cliff, g.	Utah.	300,000	1	120,000	Jan. '13	0.10
Cliff, g.	Alas.	100,000	1	180,000	Nov. '12	0.05
Colo. Gold Dredging.	Colo.	100,000	10	300,000	Aug. '13	0.25
Colorado, l.s.g.	Utah.	1,000,000	0.20	2,570,000	Dec. '12	0.03
Columbus Con., g.s.	Utah.	285,540	5	226,832	Oct. '07	0.20
Commercial Gold.	Ore.	1,750,000	1	43,750	Dec. '10	0.00½
Con. Mercur., g.	Utah.	1,000,000	1	3,415,313	July '12	0.03
Continental, z. l.	Mo.	'22,000	25	297,000	July '13	0.50
Copper Range Con., c.	Mich.	393,445	100	13,788,175	July '13	0.75
Daly Judge, s.l.	Utah.	300,000	1	585,000	June '13	0.15
Daly West, s.l.	Utah.	180,000	20	6,606,000	Jan. '13	0.15
Doctor Jackpot, g.	Colo.	3,000,000	0.10	45,000	Mar. '11	0.00½
Doe Run, l.	Mo.	65,782	100	3,237,869	Dec. '12	1.50
Elkton Con., g.	Colo.	2,500,000	1	3,079,460	Aug. '13	0.02
El Paso, g.	Colo.	490,000	5	1,658,545	Mar. '13	0.12½
Ernestine, g.s.	N.M.	300,000	5	400,000	Dec. '12	0.00½
Fed. M. & S., com.	Idaho.	60,000	100	2,708,750	Jan. '09	1.50
Fed. M. & S., pf.	Idaho.	120,000	100	9,028,060	June '13	1.50
Florence, g.	Nev.	1,050,000	1	840,000	Apr. '11	0.10
Frances-Mohawk, g.	Nev.	912,000	1	546,000	Jan. '08	0.05
Free Coinage, g.	Colo.	10,000	100	180,000	Dec. '09	1.00
Fremont Con., g.	Calif.	200,000	2.50	202,000	Aug. '13	0.02
Frontier, s.	Wis.	1,250	100	171,272	Aug. '13	2.00
Gemini-Key'ne, l.g.s.	Utah.	5,000	100	2,110,000	May '13	10.00
Gold Chain, g.	Utah.	1,000,000	1	130,000	May '13	0.03
Gold Coin of Victor.	Colo.	1,000,000	1	1,350,000	Feb. '09	0.02
Gold Dollar Con.	Colo.	2,500,000	0.10	100,000	Dec. '12	0.00½
Gold King Con., g.	Colo.	5,750,370	1	1,407,319	Dec. '11	0.03
Golden Cycle, g.	Colo.	1,500,000	5	2,501,000	Aug. '13	0.02
Golden Star, g.	Ariz.	400,000	5	140,000	Mar. '10	0.05
Goldfield Con., g.	Nev.	3,558,367	10	24,906,811	Apr. '13	0.30
Grand Central, g.	Utah.	500,000	1	1,520,750	Apr. '13	0.05
Granite, g.	Colo.	1,650,000	1	269,500	Nov. '12	0.01
Hazel, g.	Cal.	900,000	1	873,000	Nov. '12	0.01
Hecla, l.s.	Idaho.	1,000,000	0.25	2,870,000	July '13	0.02
Hercules, l.s.	Idaho.	1,000,000	1	3,650,000	July '11	0.06
Homestake, g.	S. D.	218,400	100	33,367,791	Aug. '13	0.65
Horn Silver, l.s.z.	Utah.	400,000	25	5,662,000	Sept. '07	0.05
Iowa, g.s.l.	Colo.	1,666,667	1	217,000	July '13	0.00½
Iowa-Tiger Leasing g.s.	Colo.	12,655	1	13,921	Jan. '12	0.10
Iron Blossom, s.l.g.	Utah.	1,000,000	0.10	1,670,000	Jnly '13	0.10
Iron Silver, s.l.g.	Colo.	500,000	20	4,700,000	Apr. '13	0.10
Jamison, g.	Cal.	390,000	10	378,300	Jan. '11	0.02
Jerry Johnson, g.	Colo.	2,500,000	0.10	150,000	Aug. '11	0.01
Kendall, g.	Mont.	500,000	5	1,475,000	Nov. '12	0.02
Kennedy, g.	Cal.	100,000	100	1,831,001	Apr. '10	0.03
King of Arizona, g.	Ariz.	200,000	1	396,000	Aug. '09	0.12
Klar Piquette, z.l.	Wis.	20,000	1	162,500	Dec. '12	0.50
Knob Hill, g.	Wash.	1,000,000	1	45,000	May '12	0.00½
Liberty Bell, g.	Colo.	130,551	5	522,093	Oct. '10	1.00
Little Bell, l.s.	Utah.	300,000	1	75,000	Mar. '11	0.05
Little Florence, g.	Nev.	1,000,000	1	430,000	Jan. '08	0.03
Mammoth, g.s.c.	Utah.	400,000	25	2,300,000	July '13	0.05
Mary McKinney, g.	Colo.	1,309,252	1	1,051,373	July '13	0.02
May Day, g.s.l.	Utah.	800,000	0.25	148,000	Feb. '13	0.03
Mexican, g.s.	Nev.	201,600	2.50	20,160	Aug. '11	0.10
Miami, c.	Ariz.	664,993	5	2,216,708	Aug. '13	0.50
Modoc, g.s.	Colo.	500,000	1	275,000	Dec. '11	0.01
Mohawk M. Co.	Mich.	100,000	25	3,175,000	Aug. '13	2.00
Monarch-Mad'a, g.s.l.	Colo.	1,000,000	1	40,000	May '11	0.01
Montana-Tonop., s.g.	Nev.	921,865	1	530,000	Dec. '12	0.10
Mountain, c.	Cal.	250,000	25	4,216,250	May '08	0.44
National, g.	Nev.	750,000	1	570,000	May '11	0.10
Nevada Con., c.	Nev.	1,999,394	5	12,237,986	June '13	0.37½
New Century, z.l.	Mo.	330,000	1	237,600	Oct. '09	0.01
New Idria, q.	Cal.	100,000	5	1,710,000	June '13	0.10
North Butte, c.	Mont.	410,000	15	11,070,000	July '13	0.50
North Star, g.	Cal.	250,000	10	3,886,989	June '13	0.20
Old Domin'n, M. & Sm.	Ariz.	162,000	25	3,158,500	July '13	1.25
Ophir, s. g.	Nev.	201,600	3	2,068,360	Jan. '12	0.10
Opohongo, g.s.l.	Utah.	898,978	0.25	80,907	Jan. '13	0.02
Oroville Dredging.	Cal.	700,000	5	1,383,036	Dec. '09	0.12½
Osceola, c.	Mich.	96,150	25	11,698,925	July '13	3.00
Parrot, c.	Mont.	229,850	10	7,255,750	May '13	0.15
Pearl Con., g.	Wash.	1,909,711	0.05	181,422	Dec. '10	0.02
Pharmacist, g.	Colo.	1,500,000	1	87,500	Feb. '10	0.00½
Pioneer, g.	Alas.	5,000,000	1	4,041,526	Oct. '11	0.03
Pittsburgh-Idaho, l.	Ida.	803,000	1	216,810	Oct. '12	0.04
Pittsburgh Silver Peak, g.	Nev.	2,790,000	1	613,800	June '13	0.02
Portland, g.	Colo.	3,000,000	1	9,337,080	Aug. '13	0.02
Quilp.	Wash.	1,500,000	1	67,500	Feb. '13	0.01
Quincy, c.	Mich.	110,000	25	20,732,500	June '13	1.25
Republic, g.	Wash.	1,000,000	1	85,000	Dec. '10	0.01½
Rochester, l.s.	Mo.	4,900	100	188,396	Dec. '10	0.50
Round Mountain, g.	Nev.	866,426	1	363,365	Aug. '13	0.04
Seven Troughs Coal., g.	Nev.	1,500,000	1	37,500	July '12	0.02½

Mining Companies—United States—(*Continued*)

Name of Company and Situation		Shares Issued	Shares Par	Dividends Total	Dividends Latest	Dividends Amt
St. Joseph, l.	Mo.	1,000,000	$10	$ 8,860,357	June '13	$0.15
Shannon, c.	Ariz.	300,000	10	750,000	Jan. '13	0.50
Shattuck-Arizona, c.	Ariz.	350,000	10	1,400,000	July '13	0.50
Silver King Coal. l.s.	Utah.	1,250,000	5	2,159,885	Apr. '13	0.15
Sioux Con., s.l.g.	Utah.	745,389	1	872,097	July '11	0.04
Skidoo, g.	Cal.	1,000,000	5	275,000	May '12	0.02½
Smuggler, l.s.z.	Colo.	1,000,000	1	2,235,000	Nov. '06	0.03
Snowstorm, c.g.	Ida.	1,500,000	1	1,169,610	July '13	0.01½
South Eureka, g.	Calif.	299,981	1	366,881	Apr. '12	0.07
Standard Con., g.s.	Cal.	178,394	10	5,229,809	Jan. '12	0.10
Stratton's Ind., g.	Colo.	1,000,000	0.60	486,000	May '13	0.06
Success, z.	Ida.	1,500,000	1	925,000	May '13	0.02
Superior & Pitts., c.	Ariz.	1,499,793	10	4,799,340	June '13	0.38
Tamarack, c.	Mich.	60,000	25	9,420,000	July '07	4.00
Tennessee, c.	Tenn.	200,000	25	3,556,520	June '13	0.75
Tomboy, g. s.	Colo.	300,000	4.85	3,069,090	June '13	0.48
Tom Reed, g.	Ariz.	909,555	1	1,427,886	Aug. '13	0.06
Tonopah Belm't, s.g.	Nev.	1,500,000	1	4,718,003	July '13	0.25
Tonopah Ext., g.s.	Nev.	943,433	1	377,370	July '13	0.02½
Tonopah of Nev., s.g.	Nev.	1,000,000	1	10,850,000	July '13	0.40
Tri-Mountain, c.	Mich.	100,000	25	1,250,000	Dec. '12	3.00
Tuolumne, c.	Mont.	800,000	1	520,000	May '13	0.10
Uncle Sam, g. s. l.	Utah.	500,000	1	495,000	Sept. '11	0.05
United Cop. Min., c.	Wash.	1,000,000	1	120,000	July '13	0.01
United (Crip. Ck.) g.	Colo.	4,000,100	1	440,435	Jan. '10	0.04
United Globe, c.	Ariz.	23,000	10	1,357,500	July '13	7.50
United Verde, c.	Ariz.	300,000	10	32,572,000	Aug. '13	0.75
Utah, s.l.	Utah.	100,000	10	325,000	Dec. '10	0.02
Utah, c.	Utah.	1,562,599	10	18,616,484	June '13	0.75
Utah Con., c.	Utah.	300,000	5	7,800,000	July '13	0.50
Valley View, g.	Colo.	1,000,000	1	240,000	Dec. '10	0.04
Victoria, g.s.l.	Utah.	250,000	1	207,500	Mar. '10	0.04
Vindicator Con., g.	Colo.	1,500,000	1	2,722,000	July '13	0.03
Wasp No. 2, g.	S. D.	500,000	1	421,965	Aug. '13	0.01
Wellington Mines, g.	Colo.	10,000,000	1	260,000	July '13	0.00½
Wolverine, c.	Mich.	60,000	25	7,940,000	Apr. '13	5.00
Work, g.	Colo.	1,500,000	1	172,500	July '08	0.00½
Yak, s.l.	Colo.	1,000,000	1	1,727,655	July '13	0.02
Yankee Con., g.s.	Utah.	1,000,000	1	167,500	Jan. '13	0.01
Yellow Aster, g.	Cal.	100,000	10	1,161,789	Aug. '13	0.05
Yellow Pine, l.z.s.	Nev.	950,000	1	275,508	Aug. '13	0.02
Yukon Gold, g.	Alas.	3,500,000	5	4,987,500	June '13	0.07½

Coal, Iron, Industrial and Holding Companies

Amalgamated, c.	Mont.	1,538,879	$100	$78,968,110	Aug. '13	$1.50
Am. Sm. & Ref., com.	U. S.	500,000	100	24,333,333	June '13	1.00
Am. Sm. & Ref., pf.	U. S.	500,000	100	44,606,333	June '13	1.75
Am. Smelters, pf. A.	U. S.	170,000	100	7,875,000	July '13	1.50
Am. Smelters, pf. B.	U. S.	300,000	100	11,982,000	July '13	1.25
Cambria Steel.	Penn.	900,000	50	17,897,500	Aug. '13	0.62½
Greene Cananea.	U. S.	2,471,314	25	2,426,877	Mar. '13	0.25
Guggenheim, Expl.	U. S.	831,732	25	16,353,449	July '13	0.62½
Inter'l Nickel, com.	U. S.	115,826	100	9,141,183	June '13	3.00
Inter'l Nickel, pfd.	U. S.	89,126	100	4,140,503	Aug. '13	1.50
Inter'l Sm & Ref.	U. S.	100,000	100	3,300,000	Aug. '13	2.00
Lehigh Coal & Nav.	Penn.	482,956	50	22,535,092	Nov. '12	1.00
National Lead, com.	N. Y.	206,554	100	7,385,393	June '13	0.75
National Lead, pf.	N. Y.	243,676	100	26,708,074	Apr. '13	1.75
Old Dominion, c.	Ariz.	293,245	25	4,313,579	July '13	1.25
Phelps, Dodge & Co.	U. S.	450,000	100	26,084,304	June '13	4.50
U. S. Steel Corp., com.	U. S.	5,083,025	100	188,050,070	June '13	1.25
U. S. Steel Corp., pf.	U. S.	3,602,811	100	338,768,739	Aug. '13	1.75
U. S. S., R. & M., com.	U.S.-Mex.	486,320	50	5,308,854	July '13	0.75
U. S. Sm., R. & M., pf.	U.S.-Mex.	351,105	50	12,539,695	July '13	0.87½

Canadian, Mexican and Central American Companies

Ajuchitlan, g.s.	Mex.	50,000	$ 5	$ 200,000	Oct. '12	$0.25
Amparo, g.s.	Mex.	2,000,000	1	1,166,884	Aug. '13	0.04
B. C. Copper.	B. C.	591,709	5	615,398	Jan. '13	0.15
Beaver Con., s.	Ont.	1,996,490	1	409,879	Dec. '12	0.03
Buffalo, s.	Ont.	1,000,000	1	2,907,000	Aug. '13	0.03
Cobalt Townsite, s.	Ont.	1,000,000	1	450,000	Aug. '13	0.24
Coniagas, s.	Ont.	800,000	5	5,000,000	Aug. '13	0.45
Con. M. & S. Co. of Can.	B. C.	58,052	100	1,120,165	July '13	2.00
Crown Reserve, s.	Ont.	1,768,814	1	5,306,444	Aug. '13	0.05
Crow's Nest Pass C. Co.	B. C.	248,506	25	2,182,864	Mar. '11	0.25
Dominion Coal, com.	N. S.	150,000	100	5,550,000	Jan. '13	1.00
Dominion Coal, pf.	N. S.	50,000	100	4,915,000	Aug. '12	3.50
Dos Estrellas, g.s.	Mex.	300,000	0.50	14,130,000	June '13	1.25
El Oro, g.s.	Mex.	1,147,500	4.85	8,947,261	July '13	0.24
Esperanza, s.g.	Mex.	455,000	4.85	11,330,455	July '13	0.36
Granby, s.l.c.	B. C.	148,496	100	4,642,573	June '13	1.50
Greene Con., c.	Mex.	1,000,000	10	8,044,400	Feb. '13	0.45
Guanajuato D., pf., s.	Mex.	10,000	1000	274,356	Jan. '11	3.00
Hedley Gold.	B. C.	120,000	10	984,000	June '13	0.50
Hollinger, g.	Ont.	600,000	5	990,000	Aug. '13	0.15
Kerr Lake s.	Ont.	600,000	5	4,620,000	June '13	0.25
La Rose Con., s.	Ont.	1,498,407	5	4,263,147	July '13	0.25
Le Roi No. 2, g.	B. C.	120,000	24.36	1,471,580	Jan. '13	0.36
Lucky Tiger Com., g.	Mex.	715,337	10	1,897,098	Aug. '13	0.05
McK.-Dar. Sav. s.	Ont.	2,247,692	1	3,663,165	July '13	0.10
Mines Co. of Am. (new).	Mex.	1,700,000	10	*1,215,000	July '13	0.12½
N. Y. & Hond. Ros.	C. A.	150,000	10	3,152,500	June '13	0.20
Nipissing, s.	Ont.	1,200,000	5	10,440,000	July '13	0.37½
Peñoles, s.l.g.	Mex.	80,000	25	6,361,688	June '13	1.25
Peregrina M. & M., pf.	Mex.	10,000	100	328,656	Sept. '10	3.50
Pinguico, pf., s.	Mex.	20,000	100	600,000	Oct. '11	3.00
Right of Way Mns†s.	Ont.	1,685,500	1	202,260	Dec. '11	0.02
Rio Plata, s.	Mex.	373,437	5	345,714	Feb. '13	0.05
San Rafael, g.s.	Mex.	2,400	25	1,439,780	Oct. '12	0.90
San Toy, g.s.	Mex.	6,000,000	1	540,000	July '13	0.01
Sopresa, g.s.	Mex.	19,200	20	1,517,438	Jan. '11	34.00
Stand'd Silver-Lead.	B. C.	2,000,000	1	825,000	July '13	0.02½
Timiskaming, s.	Ont.	2,500,000	1	1,534,155	Apr. '13	0.06
Tem. & Hud. Bay, s.	Ont.	7,761	1	1,823,835	Aug. '13	3.00
Trethewey, s.	Ont.	1,000,000	1	961,998	Jan. '13	0.10
Wettlaufer-Lorrain, s.	Ont.	1,416,590	1	566,636	Jan. '13	0.05

*Previous to reorganization, $5,258,881.
†Previous to January, 1910, $324,644.

Assessments

Company	Delinq.	Sale	Amt.
Central Eureka, Calif.	Aug. 14	Sept. 14	$0.025
Con. Imperial, Nev.	Aug. 28	Sept. 19	0.01
Copper Mountain, Ida.	Sept. 6	Oct. 4	0.002
Crown Point, Utah	Aug. 30	Sept. 20	0.005
Eagles Nest-Hailstone, Nev.	Aug. 25	Sept. 22	0.003
Emerald, Utah (3d install.)	Sept. 15	Oct. 11	0.005
Exchequer, Nev.	Aug. 28	Sept. 17	0.02
Florence	Aug. 16	Sept. 16	0.001
Gold Hill, Ida.	Sept. 10	Sept. 30	0.0005
Hamburg-American, Ida.	Sept. 8	Sept. 29	0.000¾
Justice, Nev.	Sept. 8	Sept. 30	0.02
Lake, Mich. (postponed)		Sept. 22	2.00
McKinley Gold, Ida.	Sept. 8	Oct. 8	0.0005
Mexican Metals (Boston)		Oct. 10	0.15
Morgan Argentine, Utah	Sept. 1	Sept. 16	0.005
Nabob, Ida.	Aug. 25	Sept. 22	0.005
New Hope, Ida.	Aug. 19	Sept. 19	0.002
Oreano, Ida.	Sept. 1	Oct. 1	0.0015
Phoenix Con., Mich.		Sept. 20	1.00
Potosi, Nev.	Sept. 4	Sept. 26	0.02
Slavonia, Ida.	Sept. 10	Sept. 30	0.002
Sonora, Ida.	Aug. 30	Sept. 16	0.002
St. Louis, Calif.	Sept. 22	Oct. 4	0.01
Sunshine, Ida.	July 1	Oct. 15	0.001
Tuscumbia, Ida.	Aug. 23	Sept. 23	0.003
Winona, Mich.		Sept. 29	1.00
Yellow Jacket, Nev.	Sept. 8	Oct. 8	0.10

Monthly Average Prices of Metals

SILVER

Month	New York			London		
	1911	1912	1913	1911	1912	1913
January	53.795	56.260	62.938	24.865	25.887	28.983
February	52.222	59.043	61.642	24.081	27.190	28.357
March	52.745	58.375	57.870	24.324	26.875	26.669
April	53.325	59.207	59.490	24.595	27.284	27.416
May	53.308	60.880	60.361	24.583	28.038	27.825
June	53.043	61.290	58.990	24.486	28.215	27.199
July	52.630	60.654	58.721	24.286	27.919	27.074
August	52.171	61.606	59.293	24.082	28.375	27.335
September	52.440	63.078	.....	24.209	29.088	.....
October	53.340	63.471	.....	24.594	29.299	.....
November	55.719	62.792	.....	25.649	29.012	.....
December	54.905	63.365	.....	25.349	29.320	.....
Year	53.304	60.835	.....	24.592	28.042	.....

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

COPPER

Month	New York				London Standard	
	Electrolytic		Lake			
	1912	1913	1912	1913	1912	1913
January	14.094	16.488	14.337	16.767	62.760	71.741
February	14.084	14.971	14.329	15.253	62.893	65.519
March	14.698	14.713	14.868	14.930	65.884	65.329
April	15.741	15.291	15.930	15.565	70.294	68.111
May	16.031	15.436	16.245	15.738	72.352	68.807
June	17.234	14.672	17.443	14.871	78.259	67.140
July	17.190	14.190	17.353	14.563	76.636	64.166
August	17.498	15.400	17.644	15.904	78.670	69.200
September	17.508	.....	17.698	.....	78.762	.....
October	17.314	.....	17.661	.....	76.389	.....
November	17.326	.....	17.617	.....	76.890	.....
December	17.376	.....	17.600	.....	75.516	.....
Year	16.341	.....	16.560	.....	72.942	.....

New York, cents per pound. London, pounds sterling per long ton of standard copper.

TIN

Month	New York		London	
	1912	1913	1912	1913
January	42.529	50.298	191.519	238.273
February	42.962	48.766	195.036	220.150
March	42.577	46.832	192.619	213.645
April	43.923	49.115	200.513	224.119
May	46.063	49.038	208.830	224.143
June	45.815	44.820	205.863	207.208
July	44.519	40.260	202.446	183.511
August	45.857	41.582	208.351	188.731
September	49.135	.....	223.762	.....
October	50.077	.....	228.353	.....
November	49.891	.....	227.619	.....
December	49.815	.....	226.875	.....
Av. year	46.096	.....	209.322	.....

New York in cents per pound; London in pounds sterling per long ton.

LEAD

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	4.435	4.321	4.327	4.171	15.597	17.114
February	4.026	4.325	3.946	4.175	15.738	16.550
March	4.073	4.327	4.046	4.177	15.997	15.977
April	4.200	4.381	4.118	4.242	16.331	17.597
May	4.194	4.342	4.072	4.226	16.509	18.923
June	4.392	4.325	4.321	4.190	17.588	20.226
July	4.720	4.353	4.603	4.223	18.544	20.038
August	4.569	4.624	4.452	4.550	19.655	20.406
September	5.048	.....	4.924	.....	22.292	.....
October	5.071	.....	4.894	.....	20.630	.....
November	4.615	.....	4.463	.....	18.193	.....
December	4.303	.....	4.152	.....	18.069	.....
Year	4.471	.....	4.360	.....	17.929	.....

New York and St. Louis cents per pound. London, pounds sterling per long ton.

SPELTER

Month	New York		St. Louis		London	
	1912	1913	1912	1913	1912	1913
January	6.442	6.931	6.292	6.854	26.642	26.114
February	6.499	6.239	6.349	6.089	26.661	25.338
March	6.626	6.078	6.476	5.926	26.048	24.605
April	6.633	5.641	6.483	5.491	25.644	25.313
May	6.679	5.406	6.529	5.256	25.790	24.583
June	6.877	5.124	6.727	4.974	25.763	22.143
July	7.116	5.278	6.966	5.128	26.174	20.592
August	7.028	5.658	6.878	5.508	26.443	20.706
September	7.454	.....	7.313	.....	27.048	.....
October	7.426	.....	7.276	.....	27.543	.....
November	7.371	.....	7.221	.....	26.804	.....
December	7.162	.....	7.081	.....	26.494	.....
Year	6.943	.....	6.799	.....	26.421	.....

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PIG IRON IN PITTSBURGH

Month	Bessemer		Basic		No. 2 Foundry	
	1912	1913	1912	1913	1912	1913
January	$15.12	$18.15	$13.32	$17.35	$14.00	$18.59
February	15.03	18.15	13.28	17.22	14.01	18.13
March	14.95	18.15	13.66	16.96	14.10	17.53
April	15.13	17.90	13.90	16.71	14.15	16.40
May	15.14	17.68	13.90	15.80	14.12	15.40
June	15.15	17.14	14.11	15.40	14.22	15.10
July	15.15	16.31	14.38	15.13	14.38	14.74
August	15.43	16.63	14.90	15.00	14.85	14.88
September	16.86	.....	16.03	.....	15.63	.....
October	17.90	.....	17.18	.....	17.22	.....
November	18.07	.....	17.09	.....	18.00	.....
December	18.15	.....	17.45	.....	18.73	.....
Year	$16.01	.....	$14.93	.....	$15.28	.....

STOCK QUOTATIONS

COLO. SPRINGS Sept. 8

Name of Comp.	Bid.
Acacia	‡.02¼
Cripple Cr'k Con.	‡.01¼
C. K. & N.	‡.10¼
Doctor Jack Pot.	.05½
Elkton Con.	.57½
El Paso	3.15
Findlay	.02
Gold Dollar	.06¼
Gold Sovereign	‡.02¼
Isabella	.10
Jack Pot	.04¼
Jennie Sample	‡.05½
Lexington	‡.005
Moon Anchor	‡.009
Old Gold	.20¼
Mary McKinney	.57½
Pharmacist	‡.01
Portland	.97
Vindicator	.87½
Work	‡.005

SALT LAKE Sept. 8

Name of Comp.	Bid.
Beck Tunnel	.05½
Black Jack	.07½
Cedar Talisman	.01
Colorado Mining	.07½
Columbus Con.	.05
Crown Point	.01¾
Daly-Judge	6.20
Grand Central	.50
Iron Blossom	1.17½
Little Bell	.10
Lower Mammoth	.01½
Mason Valley	5.50
May Day	.06
Nevada Hills	.80
New York	.02¼
Prince Con.	.42
Silver King Coal'n.	3.25
Sioux Con.	.00½
Uncle Sam	.03½
Yankee	‡.08

TORONTO Sept. 9

Name of Comp.	Bid.	Name of Comp.	Bid.
Bailey	.05¼	Foley O'Brien	.20
Coniagas	6.90	Hollinger	15.90
T. & Hudson Bay	70.00	Imperial	‡.02
Timiskaming	.24	Jupiter	.17
Wettlaufer-Lor.	.15	Pearl Lake	.33½
Apex	.01	Porcu. Gold	.09½
Big Dome	11.75	Preston E. D.	.01
Crown Chartered	‡.00¼	Rea	.15
Dobie	‡.10	Swastika	.03½
Dome Exten	.05	West Dome	‡.10

SAN FRANCISCO Sept. 8

Name of Comp.	Bid	Name of Comp.	Bid
Comstock Stocks		Misc. Nev. & Cal.	
Alta	.06	Belmont	7.12½
Belcher	.31	Jim Butler	.60
Best & Belcher	.07	MacNamara	.12
Caledonia	1.67½	Midway	.45
Challenge Con.	.08	Mont.-Tonopah	1.17½
Chollar	.01	North Star	.71
Confidence	.28	West End Con.	1.47½
Con. Virginia	.09	Atlanta	.14
Crown Point	.31	Booth	.02
Gould & Curry	.03	C.O.D. Con.	.03
Hale & Norcross	.08	Comb. Frac.	.04
Mexican	1.20	Jumbo Extension	.12
Occidental	.70	Pitts.-Silver Peak	‡.45
Ophir	.23	Round Mountain	.36
Overman	.43	Silver Pick	.03
Potosi	.03	Tramp Con.	‡.01
Savage	.11	Argonaut	2.00
Sierra Nevada	.06	Bunker Hill	‡1.75
Union Con.	.12	Central Eureka	.17
Yellow Jacket	.35	So. Eureka	‡2.50

N. Y. EXCH. Sept. 9

Name of Comp.	Clg.
Amalgamated	78½
Am. Agri. Chem.	42½
Am.Sm.&Ref.,com.	68½
Am. Sm. & Ref., pf.	101
Am. Sm. Sec., pf. B	82½
Anaconda	38½
Batopilas Min.	1½
Bethlehem Steel,pf.	72½
Chino	43½
Federal M. & S., pf.	37
GreatNor.,ore,,ctf.	34½
Guggen. Exp.	48
Homestake	104
Inspiration Con.	15½
Miami Copper	24½
Nat'l Lead, com.	46
National Lead, pf.	105½
Nev. Consol.	17½
Phelps Dodge	192½
Pittsburg Coal, pf.	84
Quicksilver, pf.	3½
Ray Con.	20½
Republic I&S,com.	23½
Republic I&S, pf.	87½
SlossSheffi'd,com.	29½
Sloss Sheffield, pf.	86
Tennessee Copper	34½
Utah Copper	55½
U. S. Steel, com.	63½
U. S. Steel, pf.	108¾
Va.Car.Chem.,pf.	98

N. Y. CURB Sept. 9

Name of Comp.	Clg.
Ariz. Belmont	.20½
Barnes King	‡1¾
Beaver Con.	.28
Big Four	.30
Braden Copper	7
B. C. Copper	2½
Buffalo Mines	2½
Can. G. & S.	.19
Con. Ariz. Sm.	⅛
Davis-Daly	2 1/16
Diam'field-Daisy	.02
Ely Con.	.06
Florence	.24
Giroux	1 1/16
Gold Hill Con.	⅛
Goldfield Con.	1½
Greene Cananea	.34
Greenwater	.04
Internat. S. & R.	‡115
Kerr Lake	3 7/16
Keystone	‡2
La Rose	2½
McKinley-Dar-Sa.	1½
Min. Co. of A. new	2½
Nipissing Mines	9½
Ohio Copper	7/16
Pacific Sm. & M.	1/16
Puebla,S. & R.	2 5/16
South Live Oak	‡2
South Utah M&S.	⅛
Stand'd Oil of N.J.	369
Stewart	1½
Tonopah	4½
Tonopah Ex.	1 15/16
Tonopah Merger	.70
Tri-Bullion	⅛
Tularosa	⅛
Union Mines	.07
United Cop., pfd.	3
Yukon Gold	2½

BOSTON EXCH Sept. 9

Name of Comp.	Clg.
Adventure	1½
Ahmeek	281
Alaska Gold M.	19½
Algomah	1½
Allouez	38
Am. Zinc	21½
Ariz. Com., ctfs.	3½
Bonanza	.32
Boston & Corbin	.90
Butte & Balak	1½
Calumet & Ariz.	67½
Calumet & Hecla	435
Centennial	13½
Cliff	1
Copper Range	40
Daly West	2
East Butte	12½
Franklin	3½
Granby	75½
Hancock	18
Hedley Gold	30
Helvetia	.40
Indiana	‡5
Island Cr'k, com	52½
Island Cr'k, pfd.	84½
Isle Royale	20¼
Keweenaw	1½
Lake	6½
La Salle	4
Mass.	3½
Michigan	1½
Mohawk	43
New Arcadian	1½
New Idria Quick.	3
North Butte	28½
North Lake	1½
Ojibway	.65
Old Dominion	52½
Osceola	86
Quincy	62
Shannon	6½
Shattuck-Ariz.	26
Superior	27½
Superior & Bost.	2½
Tamarack	31
Trinity	4½
Tuolumne	.60
U. S. Smelting	.38
U. S. Smelt'g, pf.	47½
Utah Apex	1½
Utah Con.	9½
Victoria	1 1/16
Winona	1
Wolverine	46
Wyandot	½

LONDON Sept. 3

Name of Comp.	Clg.
Camp Bird	£0 17s 6d
El Oro	0 14 9
Esperanza	1 1 3
Mexico Mines	5 15 0
Oroville	0 6 9
Santa Gert'dis.	1 0 0
Stratton's	0 1 9
Tomboy	1 6 3

BOSTON CURB Sept. 9

Name of Comp.	Bid
Bingham Mines	4
Boston Ely	.53
Butte&Lon'nDev.	.33
Butte Central	.02
Cactus	.02
Calaveras	2
Chief Cons.	1 5/16
Corbin	1 1/16
Cortez	.35
Crown Reserve	1 9/16
Eagle & Blue Bell	.90
First Nat. Cop.	3½
Houghton Copper	3½
Majestic	.31
Mexican Metals	½
Moneta Porc.	‡.07
Nevada-Douglas	2½
New Baltic	.60
Oneco	.80
Raven Copper	14
Rhode Island Coal	.01
Smokey Dev.	1
S. W. Miami	2½
South Lake	¼
Trethewey	.28
United Verde Ext.	.58

‡Last Quotation.